MODEL FOR ASSESSMENT OF TRUST WITHIN VIRTUAL PROJECT TEAMS OF CONSTRUCTION SECTOR IN THE MIDDLE EAST

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Sukhwant Kaur

DEDICATION

To my parents

Abbreviations

ACM	: Association for Computing Machinery
AGFI	: Adjusted Goodness of fit Index
AMOS	: Analysis of Moments Structures
AVE	: Average Variance Extracted
CFA	: Confirmatory Factor Analysis
CFI	: Comparative Fit Index
CMB	: Common Method Bias
CMIN	: Minimum discrepancy Index
C. R.	: Critical Ratio
CR	: Composite Reliability
DF	: Degrees of Freedom
EBSCO	: Elton B. Stephens Co., provides library resources in varied disciplines
EFA	: Exploratory Factor Analysis
GDP	: Gross Domestic Product
GFI	: Goodness of fit Index
GVT	: Global Virtual Teams
HICSS	: Hawaii International Conference on System Sciences
ICT	: Information and Communications Technology
IEEE	: Institute of Electrical and Electronics Engineers
IPO	: Inputs Processes Outcomes
ISM	: Interpretive Structural Modelling
IRP	: Interpretive Ranking Process
IRM	: Interpretive Ranking Model
JSTOR	: Journal Storage, a digital library
MICMAC	:Matriced' Impacts Croise's Multiplication Appliquée a UN Classement Analysis
ML	: Maximum Likelihood method
MSV	: Maximum Shared Variance

NNFI	: Bentler-Bonett Non Normed Fit Index (NNFI)
NPAR	: Number of Parameters
OCB	: Organizational Citizenship Behaviors
PGFI	: Parsimony Goodness-of-Fit Index
S. E.	: Standard Error
SEM	: Structural Equation Modelling
SPSS	: Statistical Package for the Social Sciences
SSIM	: Structural Self-Interaction Matrix
RMR	: Root Mean Square Residual
RMSEA	: Root Mean Squared Error of Approximation
UAE	: United Arab Emirates
VCoP	: Virtual Community of Practice
VIF	: Variance Inflation Factor

Abstract

The globalisation and changing customer needs in the Middle East required many construction companies to adopt virtual project teams for their business activities and is facing number of challenges. The Middle East is a multicultural region and hence, it's very important to understand the phenomenon of these virtual project teams who relate across multiple cultures. A great deal of literature has pointed on the importance of trust as a facilitator of positive relationships among project stakeholders and affecting the performance of the virtual project teams. It has been found through comprehensive literature review that lack of trust among team members greatly affects the performance of the team. The studies also revealed that not much has been explored on trust building among virtual team members especially in the context of the Middle East.

This research work aimed to identify key factors affecting trust in virtual project teams of construction sector and to develop a model to analyse the impact of these factors on trust of virtual teams in the context of Middle East. The comprehensive literature review of virtual project teams and existing models of trust, though not in context of the Middle East, helped in identifying various variables of trust. Both the quantitative and qualitative techniques are used in this research. The development of online questionnaire provided inputs from 403 professionals (team members and team leaders) from the virtual project teams of the Middle East. The analysis of this data through various statistical software such as IBM SPSS and AMOSv22 contributed to the identification of factors (drivers and barriers) of trust and testing of hypothesis. The model of trust evolved was validated through the semi-structured interviews of project managers and team members of virtual project teams of the construction sector of the Middle East. The ISM methodology was used to understand the relationships between various factors of trust. The IRP technique helped to identify four benefits of trust and helped to rank the various factors of trust according to the benefits of trust with respect to the construction projects of the Middle East.

The key findings resulted from this research was that the degree of communication among virtual project teams, characteristics of team members, organizational culture of

the company and cohesion among team members enhances the building of trust among virtual project teams and hence better performance of the team. Further especially in context of the Middle East, the research concluded that the diversity of the team members - functional or cultural- does not affect negatively in the development of trust. Further to this, the task- based and process based conflicts actually help the team to fulfil the organizational goals whereas the relationship based conflicts results in ego issues which creates distrust among the virtual project team members. It has been found that the leadership skills of superior and task- technology fit does not have any affect in the building of trust. Also the results showed that the teams should be mix of experienced and fresh team members.

Therefore, this model of trust offered practical guidelines to senior management and project managers of Architectural/ Engineering / Construction Companies for managing the virtual project teams in construction sector and enhancing their performance in the virtual projects. This model definitely added value to the existing knowledge on virtual project teams.

Chapter 1

Introduction

1.1 Background of the study

The United Arab Emirates (UAE) has become the destination for many multinational companies attracted by the massive development programme, especially that in the construction sector. The construction industry in the UAE has been expanding progressively and at the same time, is facing a number of challenges. The continuing market pressure throughout the project life cycle to achieve reduction in costs, improvement in quality, and reduced time to market, is becoming a threat to many construction companies. The globalisation and changing customer needs required many organizations to adopt virtual project teams for their business activities. There are various issues associated with virtual project teams such as establishing, managing, and controlling virtual teams; maintaining trust among team members, information sharing, and communication. Although computer-supported collaborative work has increased, many distributed virtual teams are not benefiting from tools and approaches. This is because of the lack of efficient and empirically proven methods, which can judge team's performance based on human factors and cultural differences. Therefore, Cross-Functional cooperation and effective teamwork have emerged as some of the crucial ingredients for making these virtual teams work.

The Middle East is a multicultural region with people coming from various backgrounds and different countries to work on various kinds of projects, and hence, it's very important to understand the phenomenon of these virtual project teams who relate across multiple cultures. Trust between project participants is considered as an important ingredient that affects the performance of virtual teams. The absence of face-to-face communication, cultural differences and geographical distance between team members contribute to impede the development of trust among team members. A great deal of literature has pointed to the importance of trust as a facilitator of positive relationships among project stakeholders. There has been a great deal of research that points to understanding of parameters of trust involving owners, suppliers and contractors of Construction Company. But there has been lack of research involving trust among virtual team members especially in the context of the Middle East (Pinto et al., 2009; M. Hosseini & N. Chileshe, 2013).

Therefore, this research work aimed to identify key factors (drivers and barriers) affecting trust in virtual project teams and to develop a model to analyse the impact of these factors on trust of virtual teams in the context of Middle East. This model of trust offered practical guidelines for managing the virtual project teams in construction sector. This model would be beneficial to senior management and project managers of Architectural/ Engineering / Construction Companies by facilitating them to know the actions required for better team collaboration in virtual teams. This will lead to greater team performance and individual learning.

1.2 Problem Statement

Construction project teams are increasingly utilising virtual project teams for delivering projects (Henderson, 2008; Ramalingam et al., 2014). Due to the pressure from globalisation, it is becoming necessary for construction organisations to adopt virtual project teams in order to deal with the challenges of the contemporary business environment (Chen & Messner, 2010). The organisations have to predict and overcome the challenges of virtual project teams through implementing effective managerial strategies for achieving the desirable outcomes (Yen et al., 2002). The implementation of virtual project teams successfully within the construction sector requires an in-depth understanding of the unique challenges that are quite different from the challenges encountered in face-to-face teams (Hosseini & Chileshe, 2013).

Against this backdrop, construction literature has been criticized for the scarcity of studies conducted about virtual project teams (Chinowsky & Rojas, 2003; Hosseini & Chileshe, 2013). Moreover, the results of the studies from other sectors of the industry such as telecommunication, health care industry, agricultural industry etc. cannot be relied upon for construction sector due to the obvious specific approach of this industry (Love et al., 2001). This implies that knowledge on virtual project teams should be created within the natural context of the construction industry. As a result, the construction industry has remained in need of creating knowledge to supply the industry with essential information of the challenges faced in deploying virtual project teams on construction projects (Hosseini & Chileshe, 2013).

According to Badrinarayanan & Arnett (2008), Prasad & Akhilesh (2002), research on virtual project teams is still in its nascent stages and because of the relative newness of virtual teams, many areas of research have not been examined (Badrinarayanan & Arnett, 2008) especially in Middle East region. Camarinha-Matos & Afsarmanesh (2003) concluded that the implementation of this new concept of virtual project teams in construction sector requires a large engineering effort in setting up of infrastructure for its functioning. There needs to have effective and efficient cooperation across different disciplines of the construction sector for the virtual project teams to be successful (Zhang et al., 2008).

A number of studies have highlighted how trust is the factor with a noticeable effect on the performance of virtual team members (Henttonen & Blomqvist, 2005; Khan, 2012; Malhotra et al., 2007). Trust is found to be very critical to effective team processes and performance (Dirks & Ferrin, 2001; Kanawattanachai & Yoo, 2002; Kiffin-Petersen, 2004). In construction industry, the challenge of building trust, team identity and team cohesiveness has to be critically evaluated in order for the successful operations of virtual project team (Chen, C.*, & Messner, J., 2010 ; Joseph, 2005). Trust is especially important in cross-disciplinary work setups (Zolin *et al.*, 2004) and lack of trust is considered as one of the main reasons for team members to resist teamwork as it interferes with effective teamwork (LaFasto & Larson, 2001).

Kimble (2011) suggested that virtual team failure is directly related to the difficulties in building trust. It has also been found that trust within and between virtual project teams is a much more complex phenomenon as teams involve multiple different cultured interdependent actors. It is precisely because of this interdependency, however, that necessitates some element of trust being present in order for its effective functioning. The lack of trust within the client/design/construction team is responsible for the consistently low levels of performance (Nathaniel & Anthony, 2012). Also the trust greatly impacts knowledge sharing among virtual project teams (Uden & Naaranoja 2007; Brahm & Kunze, 2012; Nandhakumar & Baskerville, 2006).

Hence, even though there is increasing momentum within the construction industry to deploy virtual project teams, yet the major challenges involving trust that companies face for managing teams in distributed arrangements are not fully explored in the construction context. Driven by such need, this study is intended to present an account of the major challenges encountered throughout the life cycle of virtual project teams focusing on the importance of trust within virtual project teams in Construction Sector of Middle East.

1.3 Justification of the Study

The rationale for carrying out this research lies in the well-documented findings in the literature that mentions that many previous studies on virtual teams have focused on various challenges faced by virtual teams; however, there are few studies (Nathaniel & Anthony, 2012) that investigate the issues in multi-cultural virtual project teams in the context of construction sector of Middle East. The low levels of performance for the virtual project teams, as identified by certain reports, is due to the fragmented nature of the construction process and industry, lack of trust , the distinct separation of the professions, poor communication, a lack of concurrency, institutional barriers, adhoc problem-solving approaches, and collaborative spirit within the client/design/construction team (Nathaniel & Anthony, 2012).

The most important factor that was argued to have a strong impact on virtual team effectiveness is trust (Brahm & Kunze, 2012; Nandhakumar & Baskerville, 2006). When people trust one another, they believe that others are willing and able to share their knowledge, and that they will develop an obligation to share (Staples & Webster, 2008). As a result, they will share knowledge in order not to violate that obligation, and this will eventually lead to virtual team effectiveness (Pangil & Chan, 2014). It has been found that the failure of virtual project team is directly related to the difficulties of building trust and positive relationships across the three boundaries of geographical distance, time zones, and cultural differences (Kimble, 2011). Trust increases the motivation of the team members which helps them to share information among them which is needed for greater performance of the virtual team. The absence of trust leads to greater dissatisfaction among the team members that greatly affect the performance of the team (Sidawi et al.,

2012). The issue of trust is very important particularly in the context of virtual project teams because virtual project team members are "geographically dispersed" and lack "shared social-context" and "face-to-face encounter" that are considered by many researchers as irreplaceable for building trust and repairing shattered trust (Jarvenpaa & Leidner, 1999). From the comprehensive literature study, it has been found that some of the problems that multi-cultural virtual teams experience include : lack of trust among cross-cultural team members, time delays in replies, communications breakdowns due to cultural variances, unresolved conflicts among culturally different members, different holidays (Vinaja, 2003). The key findings reported by Vakola & Wilson (2004) were the challenge of developing trust , leadership and managing virtual aspects of communication. Hosseini & Chileshe, (2013) proposed that virtual project teams face particular challenges involving trust, communication, deadlines, and team cohesiveness. Therefore, TRUST is considered as one of the biggest challenges in managing a virtual team.

Based on the extensive review of 149 research papers, it has been found that 90% of the research on trust in virtual teams is being done in industry environment where the major consideration was on trust between suppliers, contractors and owners of the construction company (Kadefors, 2004a; Lau & Rowlinson, 2011; Pinto et al. , 2009; Lau & Rowlinson, 2009b) as shown in Chapter 2. From the comprehensive literature study, it can be concluded that most of what we know about trust in virtual teams is based on student participants, primarily in educational field studies and in experiments (Powell et al., 2004). It has been figured out that trust among team members of virtual project team has not been fully analysed in industry / field settings especially in Construction sector of Middle East whereas much work has already been published on open source software development teams (Ho & Richardson, 2013) and in online communities (Lee et al., 2014).

The motivation for the current research also comes from below mentioned factors:

1. Gap in the existing literature for trust among virtual teams in Construction sector in Middle East (Kadefors, 2004a; E Lau & Rowlinson, 2011; Pinto et al., 2009; Ellen Lau & Rowlinson, 2009b).
2. Research on utilizing virtual working especially in construction industry is not mature enough for providing with necessary information (Algesheimer et al., 2011; Booth, 2011; Martins & Schilpzand, 2011; Schweitzer & Duxbury, 2010; Van Pelt, 2010). As the result, there is a need for further research in the area for determining all the unknown aspects of trust in virtual team working in the construction industry.
3. Construction literature has been criticized for the scarcity of studies conducted about virtual project teams (Chinowsky & Rojas, 2003; Hosseini & Chileshe, 2013).
4. Construction boom by 2020, Qatar World Cup 2022 and a Dubai Expo in 2020 said to be key drivers (Kirk et.al, 2013). There is desire for faster completion of projects which demands multitasking and better coordination among project teams.
5. Gulf construction projects plagued by overruns because of lack of trust among team members (Jarkas, A.M. et al., 2013; Sidhawi B. et.al, 2012).
6. According to statistical analysis done by El-sheikh, Mohamed tahwia, Al-halwany, & Shiha (2014), there are only 37.60% of construction companies in Middle East that uses virtual teams. This is primarily because a lot more engineering effort is required to set up these virtual project teams and there are no proper guidelines available for managing virtual project teams in construction sector of the Middle East. Therefore the companies fear to implement virtual project teams even though globalization and changing customer needs require these kind of teams for increased performance of the projects.

These issues gave the researcher the required motivation to review literature on multi-disciplinary virtual project teams, to understand their performance factors and to propose a model to analyse the impact of these factors on trust of virtual project teams in construction sector in the context of Middle East.

1.4 Research Questions

To understand more about the research, the researcher has studied previous work as mentioned above that are related to the work though not in a direct context, but can help her understand more about the functioning of the virtual teams. Therefore, the researcher seeks to provide answers to the following research questions:

RQ 1: What are the challenges faced by Virtual project team members for providing better performance in a team?

RQ 2: What role does Trust play in the performance of Virtual Team?

RQ 3: What are the factors affecting Trust in Virtual team members?

RQ 4: How to assess the impact of those factors on the trust among virtual team members?

1.5 Research Aim and Objectives

To develop a model for assessment of trust within virtual project teams of construction sector in the Middle East.

Research Objectives

The following objectives have been identified to achieve this aim:-

1. To critically review the literature in order to understand the need and concept of virtual project teams in construction sector.
2. To identify the factors affecting the performance of virtual project teams and to examine the concept of trust in virtual project teams.
3. To critically analyse the various existing models showing effect of trust on performance.
4. To critically examine the models showing effect of various factors on trust in virtual project team members.
5. To identify the factors (drivers and barriers) of Trust development among virtual project team members.
6. To propose and validate a model for assessment of Trust within virtual project team members of construction sector in the Middle East.

1.6 Scope of the Study

The virtual project teams, as used in this research, refer to the team members who are geographically distributed and may operate from different time zones. The team members are rotated on and off a project as per their expertise. These teams are the teams which are made for specific purpose for a duration of project and often are located in different country other than their head office. These teams are made to reduce the project costs, enable faster execution of the projects and lead to efficiently utilize employee time and skills across the organizations.

It is also understood from the literature that the construction industry consists of many stages of projects starting from pre-bid engineering, estimation, detailed engineering, procurement, construction and commission. The context of virtual project teams covers all the stages of the project. It is not restricted to any one stage of the project.

In this research, various terminologies are used. The challenges and factors affecting trust are used as synonyms. Their meaning is same. The factors can be divided into positive factors called drivers of trust and negative factors called barriers of trust building in virtual project teams. For e.g. the communication among the team members is considered as the driver of trust building whereas the conflict within the virtual project teams is considered as the barriers in the development of trust. The indicators and variables are used as synonyms. They are the result of extensive literature review on virtual project teams. These variables when fed in IBM SPSS statistical software for factor analysis resulted into factors which are nothing but grouping of similar variables or indicators. This process results in removal of redundant variables or indicators from the research.

1.7 Benefits of the Study

This research could be beneficial to Project Managers of Architectural / Engineering / Construction Companies by helping them know the actions required for better team collaboration in virtual teams. This would lead to greater team performance and individual learning.

The research contributions to the body of knowledge are listed as follows:-

i. The research would add on existing knowledge on Virtual Project teams in Construction sector.

ii. The research would contribute to further understanding of the factors (drivers and barriers) that are extremely critical for the success or failure of virtual project teams and which were not presented before with respect to construction sector.

iii. The research would signify the motivational as well as technological parameters that play a crucial role in virtual project based project management.

iv. The research and its model on the factors of trust building would provide valuable guidelines for further research in the field.

v. The developed model from this research would provide a structure that would assist the project managers in construction sector on improving the relationships among virtual project team members for better team collaboration and building trust.

vi. It is expected that the developed model would highlight the clear areas, which needs attention of project team for effective future planning, design and implementation of distributed projects.

1.8 Structure of Thesis

The structure of thesis is summarized in figure 1. It is organized into nine chapters: after this introduction (Chapter 1), Chapter 2 and Chapter 3 constitute the theoretical foundation and perspective of this study. Chapter 4 presents the virtual project teams' trust indicators and hypothesis construction. The research methodology is presented in Chapter 5. Chapter 6 draws upon empirical data collection, analysis and results and builds a conceptual model of trust. Chapter 7 validates the model through semi – structured interviews of experts from the construction sector of the Middle East. The Interpretive Structural Modelling(ISM) and Interpretive Ranking Process(IRP) suggests

the importance and ranking of factors of trust which helps in building practical guidelines for managing the virtual project teams in construction sector. Finally, a conclusion, recommendation, and future outlook are provided in Chapter 9.

Chapter one gives a general introduction to the study, discusses the problem statement as well as justification for the study from which the research questions were formulated. It further highlights the stated aims and objectives through which the questions would be addressed and the expected benefits from the study are addressed.

Consequently, chapter two discusses the processes of Construction Industry of United Arab Emirates. It focuses on definition and different types of Virtual project teams, which led to the understanding of difference between traditional teams and virtual project teams. The challenges of virtual project teams were understood from the literature review. The issue of trust in virtual project teams along with layers and types of trust was discussed in order to give deeper insight into the understanding of trust in virtual project teams.

Chapter three focuses on the two different sets of models of trust and performance. First, there was discussion on various models depicting the effect of trust on performance and secondly, there were different models showing the factors affecting the trust in virtual project teams. These models were needed by the researcher to understand the existing models of Trust, though they are not available in literature for the Middle East context, but they were studied to get a broader perspective of the issues related to the trust among virtual project teams.

Following this, the chapter four deals with the indicators affecting trust, which has been found through extensive literature review. Thereafter, the construction of Trust indicator table was done along with their references. After understanding the definitions of these indicators and after finding commonalities among them, they were grouped together to have more concise listing of the indicators. Based on the literature review findings, the research hypotheses were created and theoretical model of trust was proposed.

The proposed detailed research methodology comprising of the research philosophy, approach, strategy and methods of data collection and analysis were explained in chapter five stating the underlying rationale for their adoption. Research design is also discussed with emphasis on quantitative data collection and analysis techniques. The data analysis techniques include: factor analysis, structured equation modelling, semi-structured interviews of industry experts, Interpretive Structural Modelling(ISM) and Interpretive Ranking Process (IRP).

Chapter six discusses the results of pilot study which led to the modification of questionnaire instrument. After the distribution of online questionnaire, the data is analyzed with the help of factor analysis using SPSS tool. This analysis helped to give various factors responsible for building trust in virtual project teams of construction sector in Middle East. The Structural Equation Modelling technique using AMOS was used to build measurement and structural model of trust showing relationship among all factors which affects the building of trust in virtual project teams. This helped to test the hypothesis constructed in chapter 4.

Chapter seven discusses the validation of proposed model of trust. This validation was achieved with the help of semi-structured interviews of professionals from construction sector. The profile of the interviewees and interview process are presented in the chapter. It also presented the findings from the interviews that are organized into nine themes. The effect of each theme on trust is discussed and compared with the proposed model.

Chapter eight utilizes the ISM technique to examine the relationship among various factors of trust and resulted in ISM- based model of Trust. In addition, this chapter applies IRP technique to rank the factors of trust with respect to the benefits of trust development in virtual project teams. The implications of ISM model and IRP model of trust are discussed to provide guidelines to the project managers and senior management for building trust in the virtual project teams.

Chapter nine summarizes the findings and contributions of this study, and discusses its recommendations and the possibilities for future research avenues.

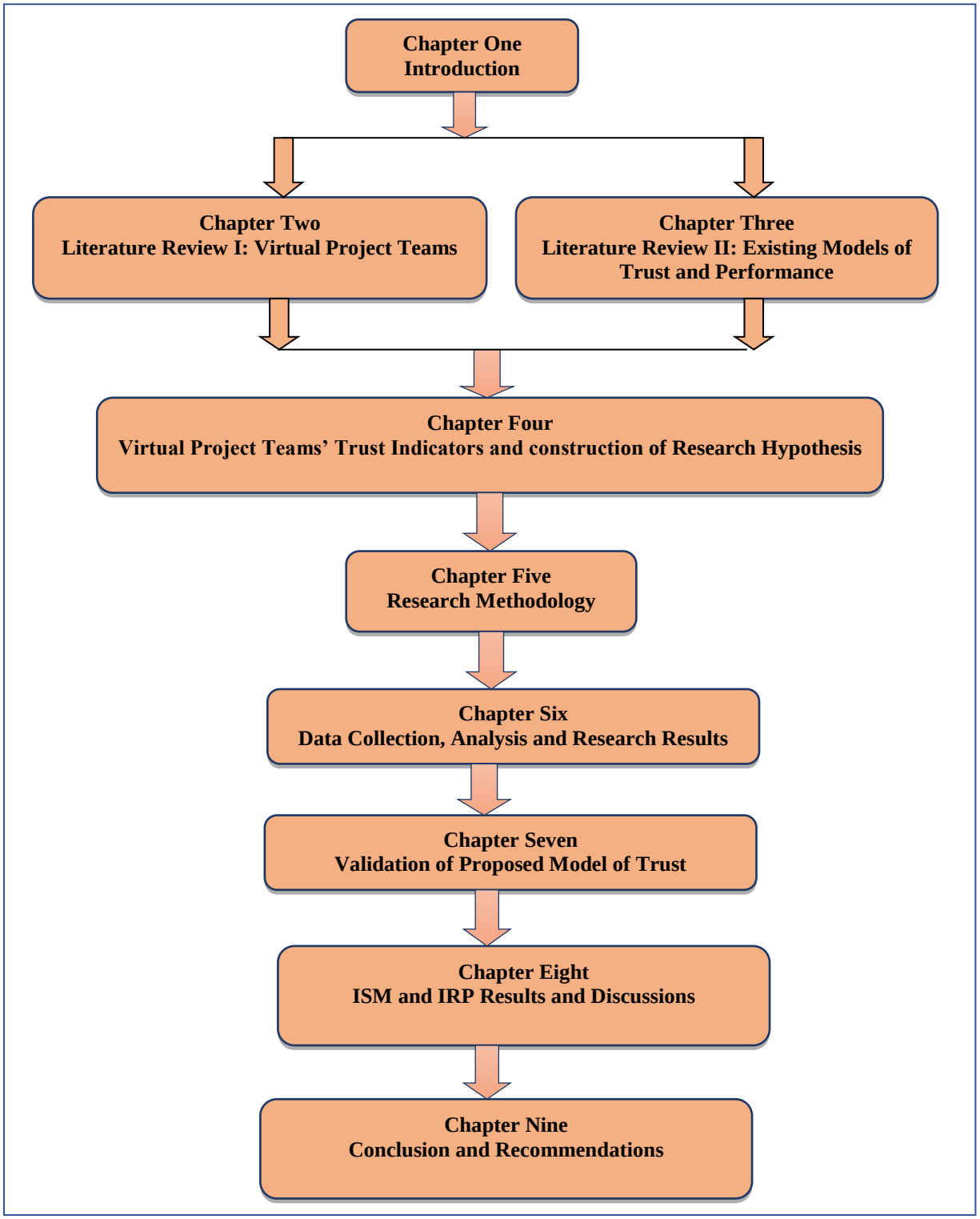


Figure 1: Structure of Thesis

1.9 Summary

In this chapter, the background of the study, problem statement and research motivation of the research have been provided. The purpose of the study, is also presented, including the research gap. It has presented the research questions, aim and objectives of the study. It also focused on the scope and benefits of this study. Finally, the structure of the thesis is revealed.

The next chapter focuses on the literature review on virtual project teams. It provides an insight to the processes of construction industry in UAE. The comparison of virtual project teams and traditional teams is done to understand the concept of virtual project teams better. The challenges of virtual project teams are found through the literature review discussed in the next chapter.

Chapter 2

Literature Review I - Virtual Project Teams

2.1 Introduction

In order to provide a timely and sufficiently in-depth analysis of the current state of the literature, the researcher followed the structured approach advocated by Webster and Watson (2002). Their first step suggests searching leading journals and conference proceedings. Therefore, the researcher began by looking at the archives from the top databases such as ACM Digital Library, Construction Information Science, Emerald Insight, EBSCO, Science Direct, Google Scholar, IEEE Explore, JSTOR, ProQuest and SAGE. Additionally, the researcher systematically searched papers from conferences such as the Hawaii International Conference on System Sciences (HICSS) with IEEE Explore and various Association for Computing Machinery (ACM). The researcher used Salford Library- SOLAR login to access E-resources of various Journals and Conferences. The researcher used variations of the words trust, computer mediated teams, virtual teams, dispersed collaboration, virtual groups, performance of virtual project teams, trust in virtual project teams for the search of research articles.

The researcher followed Webster & Watson's (2002) steps two and three by going backward through the references from the papers identified in step one and going forward by identifying papers that cite the articles identified in steps one and two. The researcher identified 196 papers from the search. After removing conceptual papers and papers that did not have trust as a variable, the researcher ended up with 149 relevant studies covering basics of virtual teams, challenges of Virtual teams and trust in virtual teams.

Table 2.1 summarizes the number of studies identified by journal versus conference for period of 5 years starting from 1995. The table shows that from 2006 onwards, there has been a peak of research done on concept of trust in Virtual Teams. Based on Literature review of research papers, out of 149 studies on virtual teams carried out so far, 48 papers belonged to a category of study on Virtual teams in various parts of the world. The rest 101 studies contributed to the variables or challenges of virtual teams.

Table 2.1: Number of Studies by Year and Type of Outlet

Year	Concurrent Engineering			Virtual Teams			Study of Variables of Trust			Research Methodology			Total
	Journal	Conference	Article	Journal	Conference	Article	Journal	Conference	Article	Journal	Conference	Book	
1995-2000	10	2	1	2	-	-	6	3	-	-	-	3	27
2001-2005	1	-	1	8	-	3	16	9	1	1	1	4	45
2006-2010	4	-	-	2	-	2	29	8	3	2	1	2	53
2011-2015	6	1	1	4	-	2	36	9	6	4	1	1	71
Total	21	3	3	16	-	7	87	29	10	7	3	10	196

Table 2.2 shows the design details in relation to subject type and team size. The researcher identified 30 educational field studies involving student participants and 59 Organizational field studies involving industry employees. The organizations involved in the study belong to High Tech IT companies, Online Communities, Telecommunication Company, Health care Industry, Private Enterprises from various parts of world such as South Africa, Australia, UK, USA, Germany, Egypt, Malaysia, Korea, Brazil, Taiwan and Turkey. Even though, we do have 59 organizational field studies, only 8 studies involved trust in Contractor-Owner-Supplier of construction companies of China, Canada, Sweden, Vietnam, UK, Hong Kong and Netherlands. This further confirms our point that there is a gap of research in literature involving trust in various team members of virtual teams in construction sector. The table 2.2 also provides information on the number of studies for different team sizes for virtual project teams.

Table 2.2: Number of Studies by Subject Type and Team Size

	Educational Field Study	**Organizational Field Study**	**Experiment**	**Total**
Subject Type				
Student participants	30	-	10	40
Non-student participants	-	59	4	61
Team Size				
Small (3 – 4)	14	1	5	20
Medium (5 – 7)	7	5	4	16
Large (8 or more)	4	13	-	17

2.2 Processes of Construction Industry in UAE

The traditional delivery approach in construction followed 'The over the Wall approach' as shown in figure 2.1. In this approach, based on the client requirement, the architect produces an architectural design, which is given to the structural engineer, who on completing the structural design passes the project to the quantity surveyor to produce the costing and bill of quantities. This goes on until the project is passed on to the contractor who takes the responsibility for the construction of the facility.

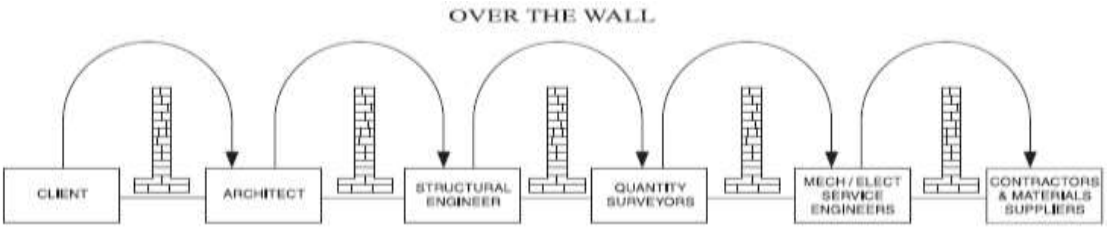


Figure 2.1: Over the wall Approach; source Evbuomwan and Anumba (1998)

This over the wall approach involves various disadvantages like fragmentation of the different participants in the construction project - leading to misconceptions and misunderstanding; fragmentation of design and construction data - leading to design clashes, omissions and error; late and costly design changes; lack of communication of design rationale - leading to confusion and wasted effort (Anumba et al., 2002). In construction projects, rework can result from various reasons such as poor supervision, errors, omissions, stringent inspection, change orders, poor coordination, and ineffective communication which cause delays in the completion of projects.

Nathaniel & Anthony (2012) indicated that the construction industry has been facing continuously increasing and sophisticated demands, which call for most efficient use of resources. Project life cycles are shrinking virtually in all areas. In response to this, the construction industry has fragmented the production responsibilities into many sub-processes. These sub-processes are being split amongst many participants. These participants belong to various organizations with different policies, objectives and practices (Aniekwu, 2002). For this to happen, the construction industry has to rely on foreign skills and technologies leading to the evolution of virtual teams. Such teams are

expected to comprise of capable individuals representing the relevant departments in the organization as shown in figure 2.2.

Figure 2.2: Concept of Virtual Project Teams in Construction Industry [Source: www.tes.com]

Karlsson (2014) suggested the following reasons for the possible need of virtual project teams in any construction project:

- The specific competence(s) needed is/are not available in the nearby area.
- Procurement of the projects design phase has resulted in the project involving participants that are geographically distributed.
- Material suppliers are non-local and their specific product influences the design of other disciplines.
- The client is non-local and is not represented locally by an agent.
- The project is a joint venture between different companies located in different geographical places.

If a scenario like the ones mentioned above, or a combination of them, occurs in a project, it might be useful for an organization to investigate the possibility to setup a virtual project team to facilitate the work.

2.3 Definition of Virtual Project Teams

In order to have international presence in a global market place, more and more companies feel the need for creating virtual project teams. The organizations can assign the most qualified people to appropriate projects by dynamically allocating people to projects based on expertise rather than location. This will reduce the expense and wasted productivity caused by extensive travel or frequent relocation (Goldman, 2000). A global

virtual team is defined as a temporary team which is formed on need basis for a particular duration of the task and staffed by people from across the world (Jarvenpaa, Knoll, & Leidner, 1998). Hertel, Geister, & Konradt, (2005) suggested that virtual teams are distributed work teams whose members are geographically dispersed and coordinate their work with electronic communication technologies such as e-mail, video-conferencing, telephone, etc. From the perspective of Leenders et al. (2003), virtual teams are groups of individuals collaborating in the execution of a specific project while geographically distributed, often away from their parent organization. El-sheikh, Mohamedtahwia, Al-halwany, & Shiha (2014) stated that a multi-cultural virtual project team is a team whose members have different cultural backgrounds belonging to different countries.

Lurey and Raisinghani (2001) defined virtual teams as groups of people who work together even though they are often dispersed across space, time, and organizational boundaries. Amongst the different definitions of the concept of a virtual team, the following definition is one of the most widely accepted: (Powell et al., 2004 p.7), ‘‘we define virtual teams as groups of geographically, organizationally and/or time dispersed workers brought together by information technologies to accomplish one or more organization tasks’’. For the construction industry, distributed teams could be defined as “groups of geographically, organisationally and/or time dispersed intelligent workers with different skills and in different positions of the hierarchy heavily relied on ICTs to accomplish engineering tasks which for all are held accountable” (Hosseini & Chileshe, 2013, p.1103).

The virtual teams have become norm with the most corporate companies such as consulting firms, technology infrastructures and e- commerce because of globalization due to improved telecommunications infrastructures (Lurey & Raisinghani, 2001). The virtual teams are also being increasingly examined in academic literature (Powell et al., 2004) , in open source software development (Ho & Richardson, 2013) and in online communities(Lee et al., 2014). According to statistical analysis done by El-sheikh, Mohamedtahwia, Al-halwany, & Shiha (2014), there are only 37.60% of construction companies in Middle East that uses virtual teams. Due to this result, a large engineering

effort is needed. Therefore, there is a strong need of virtual project teams for construction sector which would benefit organizations to achieve a global scope of work for these companies in the Middle East. Wayna (2000) concluded that many more construction companies have instituted virtual work places and have reaped the benefits of reduced real estate expense, increase productivity, higher profit, and improve customer service, environmental benefits, and access to global markets.

Virtual teams operate across space, time, culture, and organizational boundaries using electronic means.

- The **spatial dispersion** dimension refers to the extent to which team members' work across different locations.
- The **temporal dispersion** dimension pertains to the degree to which team members operate at different times.
- The **cultural dispersion** dimension relates to the extent to which a team consists of employees from different countries or cultures.
- The **organizational dispersion** dimension refers to the degree to which team members' work across organizational boundaries.

2.4 Types of Virtual Project Teams

The virtual project teams are differentiated depending on the number of persons involved and the degree of interaction between them (Nader Ale Ebrahim et al., 2009). There are three specifications of virtual project teams depending on the interactions. The first is *telework telecommuting* which is done partially or completely outside of the main company workplace with the aid of information and telecommunication services. Virtual groups exist when several teleworkers are combined and each member reports to the same manager. The second is *virtual project teams* that exist when the members of a virtual group interact with each other in order to accomplish common goals. The third is *virtual communities* that are larger entities of distributed work in which members participate via the internet and are guided by certain roles and norms.

Cascio and Shurygailo (2003) have provided with four types of virtual project teams by classifying them with respect to number of managers (one or more) and number of locations (one or more) (Liz, .L.K., & Tim, S., 2007). Therefore there are four categories of teams:

- Teleworkers: A single manager of a team at one location.
- Remote team: A single manager of a team distributed across multiple locations.
- Matrixes teleworkers: Multiple manager of a team at one location.
- Matrixes remote teams: Multiple managers across multiple locations.

Additionally, in their book 'Mastering Virtual Teams', Duarte & Snyder (2001) observed that virtual teams have many different configurations and that they can be categorized into seven basic types of teams: project or product-development teams, which are the focus of this research, networked teams, parallel teams, work or production teams, service teams, management teams, and action teams (Duarte & Snyder, 2001, p. 4).

2.4.1 Project development teams: These teams are geographically distributed and may operate from different time zones. Project development teams are mainly focused on creating new products, information systems or organizational processes for users or customers. For our purposes, vendors and customers are not included in the definition of a virtual project team. If one were to include these two categories of team members in the definition of a virtual project team, almost 100% of project teams would be distributed or virtual. Virtual project teams have dispersed team members, knowledge, systems and workplaces, and are guided by organizational goals (McMahon, 2001, p. 4). In other words, a virtual project team operates across time, distance, and organizational boundaries and make decisions to meet task goals. The team members are rotated on and off a project as per their expertise. This helps the organizations to reduce project costs and leads to efficiently utilize employee time and skills across the organizations (Duarte & Snyder, 2001, p. 7).

2.4.2 Networked teams: Generally, networked teams are geographically distributed and do not belong to one organization. These teams are formed to discuss specific topics by having team members from different organizations. The team members involved in

the teams is having expertise in their own fields and generally pitches their ideas in the same discussion. These teams are frequently created and just as frequently dissolved. Furthermore, the membership of these teams is frequently very volatile with members coming in and out of the team as and when their expertise is needed. Thus, the networked team is different from a project team in that the membership is not always clearly set out from the rest of the organization and a final product is not always clearly defined and can often be a recommendation. Examples of the networked team are often found in consulting firms and in high tech organizations. The benefits of this type of team are that they can be assembled and disassembled very quickly. They are used to find creative and innovative solutions to a problem and are more agile in nature (Duarte & Snyder, 2001, p. 5).

2.4.3 Parallel teams: Parallel teams are defined as the teams who carry out special assignments and tasks that the regular organization is not equipped to do. They are highly skilled people and are specialized professionals (Duarte & Snyder, 2001, p. 6). These teams work across the boundaries of time, distance and organizations like project and networked teams. A parallel team is similar to a project team in that the team members have distinct membership making it clear who is on the team and who is not. Typically they are short lived teams a have goals as making recommendations for improvements to organizational processes. These teams serve in more of an advisory capacity in contrast to project teams that are able to make decisions with respect to their goal (Duarte & Snyder 2001, p. 6).

2.4.4 Work, production or functional teams: These teams work totally for one specific area of an organization such as finance, training and research. They perform regular and ongoing work unlike virtual project teams, networked teams, and parallel teams. Like the project team, these teams have a clearly defined membership and can be distinguished from other parts of the organization. According to Duarte and Snyder, "many work or production teams are now beginning to operate virtually and to cross time and distance boundaries." (Duarte & Snyder, 2001, p.7). These team members do not see each other and even telecommute (Duarte & Snyder, 2001, p. 7).

2.4.5 Service teams: Service teams are geographically located in different time zones. They are assigned with services such as service such as customer support, network upgrades, data maintenance, etc. Service teams can also be distributed across distance and time. These teams are desired to work for 24 X 7. This means each work is alive at all times often by making adjustable schedules of the team members. These teams are expected to work depending upon the different time zones of their customers. (Duarte & Snyder, 2001, p. 7).

2.4.6 Management Teams: An organization's management team can also be separated by distance and time. These teams are dispersed across a country or around the world but work collaboratively on a daily basis. Although these teams cross national boundaries but they never cross organizational boundaries. Their purpose is to collaborate on a regular basis to achieve corporate goals and objectives. They also deal with any other topics related to the management of an organization. (Duarte & Snyder, 2001, pp. 7-8).

2.4.7 Action Teams: These teams are created to handle crises of the companies. They offer immediate responses. They can cross distance and organizational boundaries. They are different from all of the other types of teams because they are created only to meet specific and urgent need (Duarte & Snyder, 2001, p. 8).

The summary of the types of virtual project teams are shown in table 2.3.

Table 2.3: Summary of the types of virtual teams

Type of Team	Description
Project or Product Development	Team has fluid membership, clear boundaries and a defined customer, technical requirement, and output. Longer-term team task is non-routine, and team has decision-making authority.
Network	Team membership is diffuse and fluid; members come and go as needed. Team lacks clear boundaries with organization.
Parallel	Team has clear boundaries and distinct membership. Team works in short term to develop recommendations for an improvement in a process or system.
Work or Production	Team has distinct membership and clear boundaries. Members perform regular and ongoing work, usually in one functional area.
Service	Team has distinct membership and supports ongoing customer, network activity.
Management	Team has distinct membership and works on a regular basis to lead corporate activities.
Action	Team deals with immediate action, usually in an emergency situation. Membership may be fluid or distinct.

*(Adapted from Duarte and Snyder 2001, 10)

2.5 Comparison of Virtual Project teams and Traditional Teams

Virtual teams are significantly different from traditional teams. In the traditional team, the members work next to one another, while in virtual teams they work in different locations. In traditional teams, the coordination of tasks is straight forward and performed by the members of the team together; in virtual teams, in contrast, tasks are much more highly structured. Also, the virtual teams rely on electronic communication whereas the traditional teams do not (Munkvold & Zigurs, 2007). Initially the concept of virtual project teams are not welcomed by many managers because it requires different way of supervision for handling virtual teams (Jarvenpaa & Leidner, 1999). Kratzer et al. (2005) research shows that traditional concepts of teams have become rare. Table 2.4 summarizes the distinctions.

Table 2.4: Comparison of Virtual project teams and Traditional Teams

Fully Traditional Team	**Fully Virtual Team**
Team members all co-located.	Team members all in different locations.
Team members communicate face-to-face (i.e., synchronous and personal)	Team members communicate through asynchronous means.
Team members coordinate team task together , in mutual adjustment	The team task is so highly structured that coordination by team members is rarely necessary.

*(Adapted from Kratzer *et al*. (2005))

Following are some of the advantages associated with virtual teaming along with their references from literature.

1. Virtual teams overcome the limitation of space, time and organizational boundaries that traditional teams face. This helps to reduce the relocation and travel costs. (Piccoli *et al*., 2004; McDonough *et al*., 2001; Rice *et al*., 2007; Bergiel *et al*., 2008; Cascio, 2000; Fuller *et al*., 2006b; Kankanhalli *et al*., 2006; Prasad & Akhilesh, 2002; Olson-Buchanan *et al*., 2007; Boudreau *et al*., 1998; Lipnack and Stamps, 2000).
2. The virtual teams assist in reduction of time for completion of activities of the projects. Therefore it leads to reduction in time-to-market as it becomes quicker in terms of execution of tasks (Rabelo & Jr., 2005; Kankanhalli *et al*., 2006; Chen, 2008; Shachaf,

2008; Kusar *et al*., 2004 ; Ge & Hu, 2008 ; Mulebeke & Zheng, 2006; Prasad & Akhilesh, 2002; Zhang *et al*., 2004 ; Sridhar *et al*., 2007).

3. The concept of virtual teams connects the experts in highly specialized fields digitally. This also helps the organizations to access the most qualified individuals for a particular job regardless of their location (Rosen *et al*., 2007; Hunsaker & Hunsaker, 2008).

4. The virtual teams produce better outcomes and attract better employees. It generates the greatest competitive advantage from limited resources (Martins *et al*., 2004; Rice *et al*., 2007; Chen *et al*., 2008b).

5. It is very useful for projects that require cross-functional or cross boundary skilled input (Lee-Kelley & Sankey, 2008).

6. The virtual team members perform their work without concern of space or time constraints (Lurey & Raisinghani, 2001).

7. The team members can be assigned to multiple, concurrent teams, often helping many virtual teams with their expertise. The team communications and work reports are available online to facilitate swift responses to the demands of a global market. Employees can also easily accommodate both personal and professional lives (Cascio, 2000).

2.6 Challenges of Virtual Project Teams

Even though there are many advantages of virtual project teams but new challenges also rise with them (Precup *et al*., 2006). The distributed teams' provide disappointed results if the challenges facing virtual project teams are overlooked. It is very important to tackle these issues to reap the exact benefits of virtual project teams (Mukherjee et al., 2012). Against this backdrop, very few studies have investigated the challenges facing distributed teams within the construction context as pointed out by Hosseini & Chileshe (2013).

Virtual team may allow people to collaborate more productivity at a distance, but the trip to coffee corner or across the hallway to a trusted colleague is still the most reliable and effective way to review and revise a new idea (Gassmann & Von Zedtwitz, 2003a). Some

of the problems that virtual project teams experience include the following: trusting the team members who are never seen, time delays in replies, lack of synergy among cross-cultural team members, communications breakdowns due to cultural variances, unresolved conflicts among culturally different members, different holidays (Vinaja, 2003). The key findings reported by (Vakola & Wilson, 2004) were the challenge of developing trust, leadership and managing virtual aspects of communication. Hosseini & Chileshe (2013) also mentioned that the virtual teams face particular challenges involving trust, communication, deadlines, and team cohesiveness.

From the literature, the researcher has understood that there are social, technical and structural issues involved in the operation of the virtual teams which are discussed as follows.

2.6.1 Trust: The issue of trust is very important particularly in the context of virtual teams because virtual team members are "geographically dispersed" and lack "shared social-context" and "face-to-face encounter" that are considered by many researchers as irreplaceable for building trust and repairing shattered trust (Jarvenpaa & Leidner,1999). As it's very difficult to assess team mates' trustworthiness without meeting them, it becomes a great challenge to develop trust within the team (McDonough et al., 2001). Moreover, as the life of many virtual teams is relatively limited, trust is required to be developed quickly as it hampers the information sharing among the teams (Jarvenpaa & Leidner, 1999).

To investigate into the affair of trust building, Evaristo (2003) suggested that one of the reasons people may not initially have trust in one another is the lack of knowledge about the rationale for past or present behaviors and intentions. Therefore it leads to the lack of willingness to risk vulnerability to an unknown situation. An absence of trust can lead to coordination problems an often results in conflicts. The development of trust ensures the reduction in process losses.

Cunningham and MacGregor (2000) identified that trust results into satisfaction and motivation of the team members. Teams that experienced low levels of trust among their members were less likely to share information and ideas, which led to lower performance of the teams (Driscoll, 1978; Zand, 1972).

2.6.2 Communication: In virtual teams, the effective communication and knowledge sharing results in the success of the entire team. Effective communication in virtual teams is a key to strong performance. It is the basis for developing high performance work strategies and processes. It is because of the distributed nature of their work unit, virtual team members have to rely heavily on information and communication technologies (Saunders, 2000). For the communication to be effective, it is very important to select the right technology as well. As noted by Hulnick, "if technology is the foundation of the virtual business relationship, communication is the cement" (Hulnick, 2000, p. 33).

The lack of effective communication results into time delays in sending feedback and lack of a common frame of reference for all members. It also leads to differences in interpretation of written text and assurance of participation from remote team members (Crampton, 2001). Thus, teams operating in the virtual environment face greater obstacles in the information exchange as compared to the traditional teams.

Piccoli, et al (2004) analyzed team member communication on the effectiveness of virtual teams and indicated that the most satisfied team members were in virtual teams with effective coordination and communication. Wynn (2006) also indicated that teams performed more effectively when members developed effective communication and technology norms.

2.6.3 Team Cohesiveness: Cohesion is also an important aspect of the virtual team. When compared to traditional team members, virtual team members generally report weaker bonding of teammates (Burke & Chidambaram, 1996; McDonough et al., 2001; Warkentin et al., 1997). This is primarily because the team members rely significantly on the communication tools and technologies (Sproull & Kiesler, 1986).

Cohen and Bailey (1997) suggest that cohesion is a critical factor influencing the effectiveness of teams. They also concluded that a primary factor leading to team cohesion is the degree of trust among team members. Warkentin et al. (1997) found that collaborative technologies hindered the development of cohesion in virtual teams and results in less bonding among team members. However, other studies have found that for shorter projects, it's difficult to develop bonding among team members as the deadline for the project does not give them enough time to bond. And if the projects are for longer durations, initially the virtual teams begin with lower cohesion, then they develop the bonding over a period of time. This is because they get enough time to exchange social information to develop stronger cohesion. Therefore, time factor plays a great role in developing cohesion among the team members and hence it leads to the development of trust (Chidambaram, 1996).

2.6.4 Diversity or Group Heterogeneity: Virtual teams are group of members who belong to different cultures and are expert in different fields. This kind of diversity or group heterogeneity results into increased conflict among team members and less effective performance of the team (Paul & McDaniel, 2004). The reason for usage of functionally diverse members in the team is because of external knowledge sharing. This results in increased performance because the technical knowledge and feedback gives team members a push to work closer for the common goals (Cummings, 2004).

There are two kinds of diversity that exists in virtual project teams. One is functional diversity and other is demographic diversity. Functional diversity involves a range of functionally different assignments and demography diversity includes a range of categories such as race, gender, ethnicity, and nationality (Milliken & Martins, 1996). It is also noticed that team members who belong to same culture or background tend to communicate with a common language and understanding, making it easier to establish workplace norms (Oakley, 1998). But as the virtual teams are having mixed cultured people, the language barrier can become obstacles in the building of trust within the virtual team. In the absence of this common language, it also becomes difficult to develop

shared understandings and effective group processes, including the ability to collaborate with other members of the team (Dougherty, 1987).

Empirical research, however, has shown that diversity of team members can have a positive or negative effect on the trust building of the teams (Milliken & Martins, 1996; Simons, Pelled, & Smith, 1999; Tsui, Egan, & Xin, 1995; Williams & O'Reilly, 1998). As diversity is associated with difference of opinion and perspective, it may lead to conflicts resulting in the less effective performance (Bunderson & Sutcliffe, 2002). This also results in slow competitive response from the team members (Pelled, Eisenhardt, & Xin, 1999; Hambrick, Cho, & Chen, 1996). There has also been considerable research on management teams that supports the positive effects of diversity as team members in different functional areas bring both different and complementary knowledge and expertise to their teams (Bunderson, 2003).

2.6.5 Leadership: The leadership for virtual project teams needs special attention. Managing the virtual team is a task in itself. The team leaders and supervisors are required to be aware of particular issues in order to avoid any potential problems (Cascio, 2000). In building the virtual corporations, the managers must be able to understand the diversity in international cultures so that understanding the issues of virtual project teams becomes easier (O'Hara, 2001). In addition, ineffective leadership (Kayworth & Leidner, 2001) and cultural differences (Kayworth & Leidner, 2000; Sarker & Sahay, 2002) have been found to negatively impact communication effectiveness.

There are the two primary leadership functions in virtual teams: performance management and team development (Bell & Kozlowski, 2002). The team leaders should be capable of understanding the expertise of the team members and should distribute the functions to the team accordingly (Hunsaker & Hunsaker, 2008). Virtual team leaders need to distribute tasks very carefully to the team making it more of a self-managing team. The evaluation procedures for virtual team members are required to be well defined by the team leaders and cannot be same as the traditional teams. Only the perfect leadership will be able to extract potential from the virtual teams enhancing the

performance of the team. The leaders should observe environmental changes and evolutions as these can impact on team outcomes.

The team leaders must ensure that all the team members participate equally in the executions of the projects. There are individuals who need guidance and some are more dependent. The manager must look out for certain individuals and play a role of mentor to them. For example, Japan is one country who believes in working in teams and don't seem to mind being directed and pushed. However, in the U.S. it is the norm to go the extra mile alone and not need or expect a lot of direction and monitoring. Lipnack & Stamps (1997) stated that managing a successful virtual company requires 90% people and 10% technology. A virtual manager is faced with far more challenges of keeping members connected and communicating effectively across the network.

Table 2.5 shows the summary of challenges faced by virtual project teams along with their brief definitions and literature references.

Table 2.5: Summary of the challenges faced by Virtual project teams

S. No.	Challenges	Definition	Reference
1	Trust	Trust has been defined as the "willingness of a party to be vulnerable to the actions of another party, based on the expectation that the other will perform a particular action important to the person in whom trust is placed, irrespective of the ability to monitor or control that other party"	(Bal & Teo, 2001; Chi, Jen, Yang, & Fu, 2004; Dirks, 1999; Furst, Blackburn, & Rosen, 1999; Naha, Mansor, & Mirahsani, 2012; Pangil & Chan, 2014; Linda Peters & Karren, 2009; Sridhar & Paul, 2006)
2	Communication	Refers to **Synchronous** (Chat, Net meeting) or **Asynchronous** (email, electronic bulletin boards). The highly natural communication among team members, include a high degree of synchronicity, the ability to observe and convey facial expressions, the ability to observe and listen to speech will enhance VT performance. It also refers to communication quality which is defined as the degree to which the content of the communication is received and understood by the other party in the relationship.	(N. Abu Mansor & S. Mirahsani , 2012; Chang, Chuang, & Chao, 2011; Chi et al., 2004; Dorairaj, Noble, & Malik, 2012a; Hung, Dennis, & Robert, 2004; Lurey & Raisinghani, 2001; Naha et al., 2012; Pedro Gustavo Siqueira Ferreira , Edson Pinheiro de Lima, 2012; Sridhar & Paul, 2006; Xiao & Wei, 2008b)
3	Group Cohesiveness,	Refers to degree to which team members are attracted to each other and are motivated to remain in the team.	(P. M. Beranek, 2000; Brahm & Kunze, 2012; Garrison, Wakefield, Xu, & Kim, 2010; Paul, Seetharaman, Samarah, & Mykytyn, 2004; Sridhar & Paul, 2006;

			Warkentin, Sayeed, & Hightower, 1997)
4	Diversity	**Functional Diversity-** involves a range of functional assignments; **demographic diversity -** includes a range of categories such as race, gender, ethnicity, and nationality.	(Amah, Nwuche, & Chukuigwe, 2013b; Bao, Yang, Xie, & Zhou, 2004; Garrison et al., 2010; Muethel, Siebdrat, & Hoegl, 2012; Naha et al., 2012; Linda Peters & Karren, 2009; Pinjani & Palvia, 2013; Saxena & Burmann, 2014a)
5	Leadership	It is characterized by the following points: 1. **Communication**(The leader provides continuous feedback, engages in regular and prompt communication, and clarifies tasks); 2. **Understanding** (the leader is sensitive to schedules of members, appreciates their opinions and suggestions, cares about member's problems, gets to know them, and expresses a personal interest in them); 3. **Role clarity** (the leader clearly defines responsibilities of all members, exercises authority, and mentors virtual team members); 4. **Leadership attitude** (the leader is assertive yet not too "bossy," caring, relates to members at their own levels, and maintains a consistent attitude over the life of the project).	(Amah et al., 2013b; Bergiel, Bergiel, & Balsmeirer, 2008; Chi et al., 2004; Daspit, Tillman, & Mckee, 2013; Harell & Daim, 2009; Horwitz, Desmond, & Ulrik, 2006; Lurey & Raisinghani, 2001; Xiao & Wei, 2008a)

In building a virtual team, all of these issues must be at least implicitly addressed in order to have an effective virtual team (Hunsaker & Hunsaker, 2008). Virtual teams are challenged because they are virtual; they exist through computer mediated communication technology rather than face-to-face interactions (Gaudes et al., 2007) (Hardin et al., 2007).

2.7 Issue of Trust in Virtual Project Teams in Middle East

The construction industry in the United Arab Emirates (UAE) is a multibillion dollar industry, contributing approximately 8% to the nation's GDP(Ailabouni, Painting, & Ashton, 2009). Construction project teams are increasingly utilising virtual project (distributed) teams for delivering projects (Henderson, 2008; Ramalingam et al., 2014) due to the pressure from globalisation. It has been understood that implementing virtual project(distributed) teams successfully within the construction context requires an in-depth understanding of the unique challenges that are not necessarily similar to the challenges encountered in traditional teams (Hosseini & Chileshe, 2013). Even though

there are numerous challenges involved in the virtual project teams as mentioned in section 2.6, the most important factor that was argued to have a strong impact on virtual team effectiveness is trust (Brahm & Kunze, 2012; Nandhakumar & Baskerville, 2006).

The construction industry consists of many stages of projects starting from pre-bid engineering, estimation, detailed engineering, procurement, construction and commission. Each of these stages does not work in isolation. The information sharing is needed at every stage of the project which is not possible unless the team members have trust in fellow mates. When people trust one another, they believe that others are willing and able to share their knowledge, and that they will develop an obligation to share (Staples & Webster, 2008). As a result, they will share knowledge in order not to violate that obligation, and this will eventually lead to virtual team effectiveness (Pangil & Chan, 2014). The delivery of promised work is being dictated by the ability of the team members and this is one of the key component for a successful virtual project team. This delivery of work depends on the associations among the team members as lot of information sharing is required to run the teams successfully. This information sharing happens only when the team members trust each other to share the information on time and with sufficient quality (Jarvenpaa et al., 1998). Therefore, trust has become a key research area within construction management, as well as in the wider business and management literature. Chen, C.*, & Messner, J. (2010) and Joseph (2005) mentioned that in construction industry, the challenge of building trust, team identity and team cohesiveness has to be critically evaluated in order for the successful operations of virtual project team.

Trust has been defined as the "willingness of a party to be vulnerable to the actions of another party, based on the expectation that the other will perform a particular action important to the person in whom trust is placed, irrespective of the ability to monitor or control that other party" (Mayerson, et al. 1996, p.712). Mayer, Davis & Schoorman (1995) defined trust in terms of the faith and belief in another individual or group that they will fulfill expectations in the future. Trust is the most difficult issue associated with virtual teams (Haywood, 1998). Trust can depend on situations and have its limitations.

In some relationships, trust is only dependent on simple basic variables but as relationships mature and members get to know each other, individuals learn to trust or distrust the team members according to their characteristics (Lewicki, McAllister & Bie, 1998).

A number of studies have highlighted how trust is the factor with a noticeable effect on the performance of virtual team members (Henttonen & Blomqvist, 2005; Khan, 2012; Malhotra et al., 2007). Trust is found to be very critical to effective team processes and performance (Dirks & Ferrin, 2001; Kanawattanachai & Yoo, 2002; Kiffin-Petersen, 2004). Building trust is the most difficult task. It is probably the most complicated issue in forming a successful and effective team (Zaheer, McEvily & Perrone, 1998). As the teams are globally distributed, trust must be earned in order for the team to work (Lurey & Raisingham, 2001). The trust and relationships between group members results in the increase of creativity and critical thinking. It also helps in creating a more positive environment (Reina & Reina, 1999). Kramer (1999) points out that trust encourages members to devote time to projects, keep their focus on joint objectives, help each other, and work harder. Research shows that virtual teams that maintain high trust relationships produce higher-quality work. (Nemiro J, 2008)

Trust is especially important in cross-disciplinary work setups, as those during the design phase of a construction project. This is due to the fact that many sub-tasks are interdependent on each other for their execution. Therefore the members are required to trust the other team members' competence to perform the interdependent tasks in order to meet the client's expectations of the final product (Zolin *et al.*, 2004). Also the trust greatly impacts knowledge sharing among virtual project teams (Uden & Naaranoja 2007; Brahm & Kunze, 2012; Nandhakumar & Baskerville, 2006). The absence of trust leads to greater dissatisfaction among the team members that greatly affect the performance of the team (Sidawi et al., 2012).

Studies by Jarvenpaa, Knolle Leidner (1998) suggested that the trust in geographically distributed virtual project teams are very fragile compared to the trust between members

of co-located teams. Kimble (2011) suggested that virtual team failure is directly related to the difficulties of building trust and positive relationships across the three boundaries of geographical distance, time zones, and cultural differences. Al Momani (1996) investigated the causes of delay on 130 public projects in Jordan. The results indicated that the main causes of delay in the construction of public projects relate to project designers, user changes, weather, site conditions, late deliveries, and economic conditions. They found that the team members' behaviour towards each other delayed the projects as the members were not sharing information at the right point of time.

Based on the extensive review of 149 research papers, it has been found that 90% of the research on trust in virtual teams is being done in industry environment where the major consideration was on trust between suppliers, contractors and owners of the construction company (Kadefors, 2004; E Lau & Rowlinson, 2011; Ellen Lau & Rowlinson, 2009a; Pinto et al., 2009). It has been figured out that trust among team members of virtual project team has not been analysed in industry / field settings especially in Construction sector whereas much work has already been published on open source software development teams (Ho & Richardson, 2013) and for online communities (Lee et al., 2014). Considering the above discussed scenario, this research is designed to understand the various factors affecting trust in virtual project teams in construction sector of the Middle East.

2.8 Layers and Types of Trust found in Virtual Project Teams

The trust is a multi-dimensional concept that originates from different routes. Trust is developed at many levels (Rousseau et al, 1998) from societal to industrial, organizational, project and inter-personal. McDermott, Khalfan, & Swan, (2005) investigated the development of inter-personal trust (Oskamp, 1987) between key team members, but contextual data and other studies showed that there were a variety of contexts that impacted the levels of trust in inter-personal context. A model of these context is shown in figure 2.3.

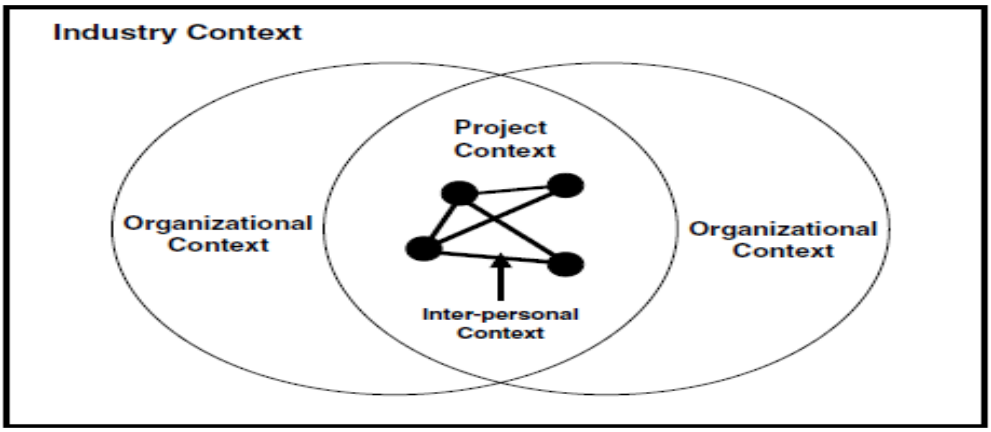


Figure 2.3: Layers of context for Trust Development

- The Organizational trust context is driven by the norms, rules and regulations and values of the organization. It is very important for the trusting organizations to trust their own staff (Tschannen Moran, 2001), supporting a no-blame culture (Woodward and Woodward, 2001). The members of these types of organizations act and respond flexibly to other team members in the project, which is a key issue for the development of trust (Black et al., 2000).
- The Inter-personal context is a trust that occurs between two individuals. Inter-personal trust between individual can be seen to start from two aspects of trust: global trust (Couch and Jones, 1997), which may be considered an individual's willingness to trust and emotive trust (Doney et. al., 1998), which is an individual's non- cognitive assessment of another individual on initial meeting.

In the light of the literature review on trust, it is proposed that trust be categorized into System-based, Cognition-based and Affect-based(Wong, Cheung, Yiu, & Pang, 2008). It is proved that the formation and maintenance of trust in virtual teams are often temporary which depends more on the cognitive element than the affective element (Meyerson, Weick, & Kramer, 1996). These categories of trust are further explained as follows:

1. System Based Trust: System-based trust focuses on formalized and procedural arrangements with no consideration on personal issues. To develop system-based trust, organizational policy, communication system and contracts/ agreements are considered as the three major attributes (Wong et al., 2008). This trust is often used as Institutional-

based trust or Rule-based trust. The institutional based trust is defined as Legal systems; conflict management and cooperation, systems regulating education and professional practice. The rule-based trust is subject to shared understandings of the system of the rules concerning appropriate behavior (Kramer, 1999).

2. Cognition-based Trust: Cognition-based trust develops from the confidence built upon knowledge that reveals the cognitive elements such as competence, reliability and professionalism of an individual or an organization (Wong et al., 2008). It is often used as Calculus-based trust, Competence-based trust, Integrity-based trust and role-based trust. This trust developed on the basis of the success of past interaction, the extent of similarity and organizational context considerations(Mcallister, 1992).

3. Affect- based Trust: Affect-based trust builds on a sentimental platform. It describes an emotional bond that ties individuals to invest in personal attachment and be thoughtful to each other(Wong et al., 2008). It is also referred as Emotional trust, Intuitive Trust and Relational trust. Being thoughtful and emotional investments are used to describe affect–based trust development.

Cognitive- and affect-based trust impact each other, and together impact levels of trust and collaborative relationship performance (Meyerson et al., 1996; Paul & McDaniel, 2004).

2.9 Summary

This chapter discussed the processes of Construction Industry of United Arab Emirates. It focused on the definition and different types of Virtual project teams which led to the understanding of difference between traditional teams and virtual project teams. The challenges of virtual project teams were understood from the literature review. The issues of trust in virtual project teams along with layers and types of trust were discussed.

In the next chapter, more focused literature review findings are discussed. It discusses the two sets of models. One set of model speaks about the effect of trust on performance. The other set of models stresses various factors that affect the building of trust in virtual project teams. The understanding of the findings of these models is required to list down the challenges for the development of trust in virtual project teams.

Chapter 3

Literature Review II- Existing Models of Trust and Performance

3.1 Introduction

Based on the extensive literature review of papers, the researcher has analysed two different kinds of models in various industrial sectors. It was needed to understand the role of trust in performance (Research Question 2) and to gain knowledge on the various factors affecting trust in virtual project teams (Research Question 3). This helped the researcher to understand the different models available in the literature which have been tested statistically and validated by using various research methodologies. It enhanced the researcher's knowledge on concept of trust in virtual project teams and also assisted her in making the model for assessment of trust for virtual project teams in construction sector of Middle East.

3.2 Models depicting the effect of Trust on Performance

The researcher analysed 15 models showing the effect of trust on performance for various industrial sectors. This assisted the researcher in understanding the importance of trust building in the virtual project teams and the role of trust in achieving the required performance. Based on their relative importance, the researcher is providing summary of only 8, the data of rest of the models is included in the table 3.1 detailing purpose of model, team size, methodology used and whether the model was validated on students' teams or non-student teams.

3.2.1 Powell, A., Piccoli, G. & Ives, B. (2004) **provided** a review of previously published work and reports on the findings from early virtual team research in an effort to take stock of the current state of the art. The review is organized around the input – process – output model and categorizes the literature into issues pertaining to inputs, socio-emotional processes, task processes, and outputs. The **methodology** involved was an exhaustive review of forty three papers which included organizational virtual teams in the field and student teams in experimental settings. The paper **concluded** with the development of research questions that hold significant potential to advance the understanding of virtual team design, processes, and effectiveness and stated a model as shown in figure 3.1 containing factors accountable for inputs, socio-emotional processes, task processes and outputs.

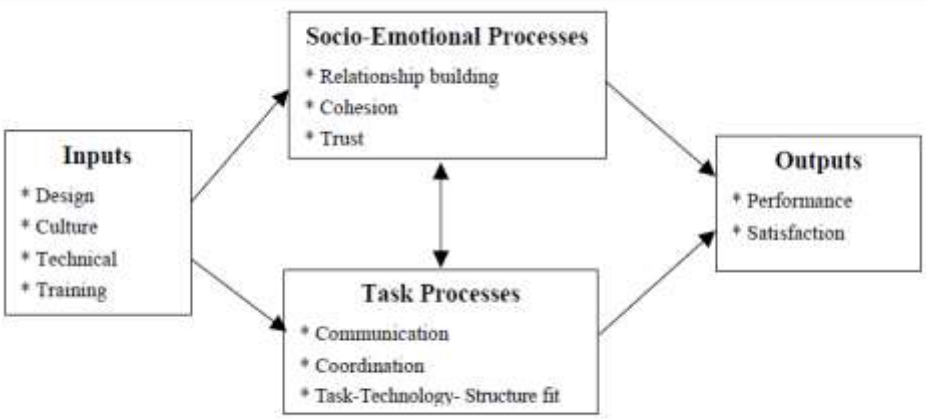


Figure 3.1 : Model containing all issues pertaining to inputs, socio-emotional processes, task processes and outputs

This model stated that trust is a part of socio-emotional processes which along with cohesion, communication, coordination and task – technology fit affects the performance of the virtual project teams.

3.2.2 Sridhar, V. & Paul, R. (2006) in their paper titled, "Analysing factors that affect performance of global virtual teams" explored a comprehensive model consisting of different variables that impact performance of global virtual teams and validate it through an exploratory experiment conducted in an academic setting. The authors proposed a model which includes- Input: trust, comfort level, motivation, communication effectiveness, cohesion; Process: initial online socialization, communication process, collaborative team work, coordination process; Outcome variable**:** project success, learning effectiveness. The **methodology** followed for research was an exploratory experimental study, which examines the performance of globally distributed virtual teams. The authors constructed items for measuring various predictor and output variables relating to performance of such virtual teams. The model was validated using a study conducted in an academic setting consisting of students at the East Carolina University (ECU), USA and Management Development Institute (MDI), Gurgaon, India. **Preliminary analysis indicates** that trust between team members and communication effectiveness of the teams has significant positive correlation with the success of virtual team projects.

This model showed that trust between team members, comfort level, motivation, communication effectiveness and cohesion of the team members influences the processes of project and is highly correlated with team members' effectiveness in execution of projects.

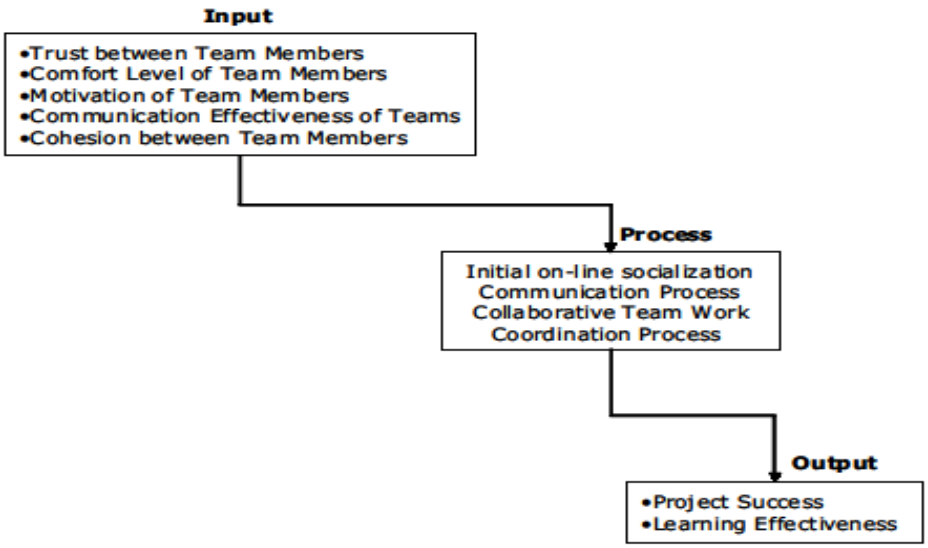


Figure 3.2: Model for factors effecting performance of the virtual project teams

3.2.3 Riedl, B.C., Gallenkamp, J. V. & Picot, A. (2013) **explored** the moderating role of virtuality on trust in leaders and the consequences on performance of employees. The effect of trust on the performance was examined. The methodology used was quantitative in nature. There were a total of 121 people, of whom 44% were women and 56% men, working at least in parts virtually with their leader. The participants were distributed in several stations, mainly throughout Germany and Europe. The data was collected using a web survey.

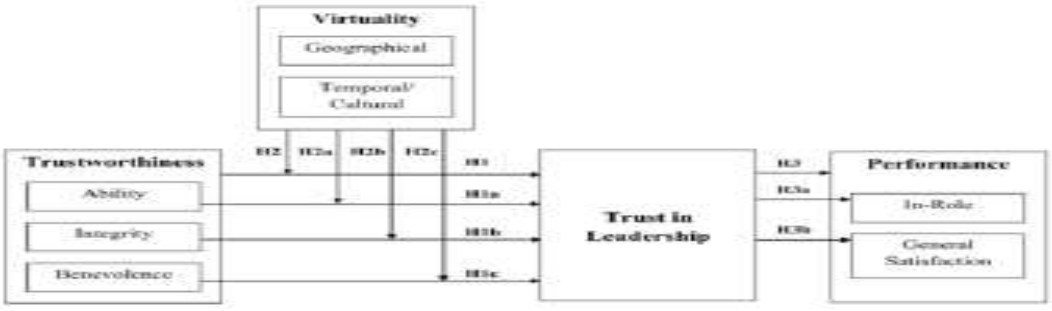


Figure 3.3 : The research model showing effect of trust on performance

The results showed that, as hypothesized, the virtuality of the relationship between leader and employee significantly influenced the relationship between trustworthiness and trust. Furthermore, the perceived trust significantly influenced both performance measures.

The analysis of the data showed the trust in leadership plays a great role in enhancing the performance of the teams.

3.2.4 Pinjani, P., & Palvia, P. (2013) **designed** a normative framework that would assist organizations in understanding the relationship between diversity, mutual trust, and knowledge sharing among GVTs, with additional focus on understanding the moderating impact of collaborative technology and task characteristics. Based on the literature study, certain hypotheses were proposed. The **methodology** used was a mix of quantitative and qualitative approach.

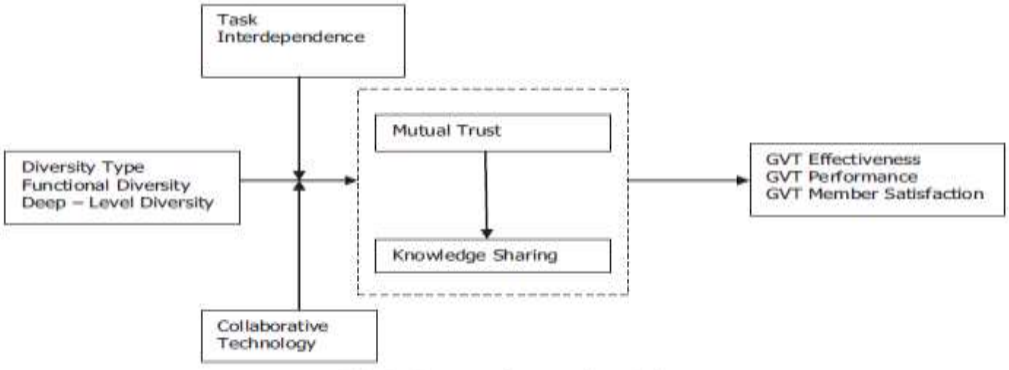


Figure 3.4: Conceptual model showing relationship between diversity, mutual trust and knowledge sharing

The **results** shown as model depicted in figure 3.4 found that in GVTs, deep level diversity has a more significant relationship with team processes of mutual trust and knowledge sharing than visible functional level diversity. This relationship is moderated by the collaborative capabilities of available technology and levels of interdependence of the task. Furthermore, knowledge sharing and mutual trust mediate the relationship between diversity levels and team effectiveness.

This conceptual model depicted the importance of mutual trust and knowledge sharing in the effectiveness of global virtual teams by discussing the role of diversity on performance and satisfaction of team members.

3.2.5 De Jong, B. a., & Elfring, T. (2010) **investigated** how trust affects the performance of ongoing teams. They propose a multiple mediator model as shown in figure 3.5 in which different team processes act as mediating mechanisms that transmit the positive effects of trust to team performance. They focused on three team-level processes—team "reflexivity," team monitoring, and team effort—and examine how these act as mediating mechanisms that together transmit the effects of trust to performance. The quantitative **methodology** was used. The data was collected through The Netherlands through a web survey. Data on trust, effort, monitoring, and reflexivity were gathered from the teams' members, whereas data on team performance were collected from the teams' supervisors.

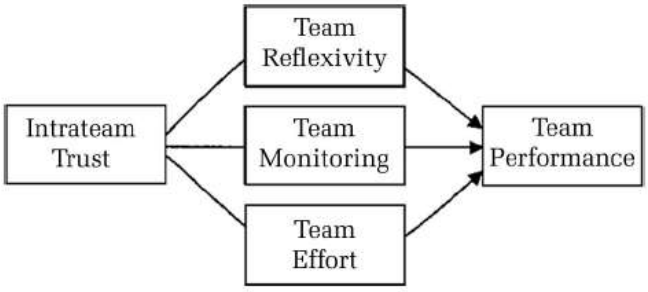


Figure 3.5: Conceptual model showing effect of trust on performance using three mediating parameters

They **found** support for the mediated effects of trust via team monitoring and team effort. The results did not support the mediating role of "team reflexivity." These findings contribute to understanding how trust operates within ongoing teams in a way that is distinct from what is known from studies of short-term teams.

This model analysed the effect of trust on the performance of the teams by analysing the mediating effect of reflexivity, monitoring and effort of the teams. The support for team monitoring and team effort is found whereas the team reflexivity does not show any support.

3.2.6 Chang, H. H., Chuang, S.-S., & Chao, S. H. (2011) **proposed a** model as shown in figure 3.6 of virtual teams to investigate how cultural adaptation, communication quality, and trust affect the performance of virtual teams and their interaction with each

other. After broadly reviewing the literature, five Research propositions were proposed. A **qualitative method** has been applied in the study. Four virtual team members from diverse teams were interviewed in order to explore how virtual teams work and whether propositions were confirmed in practice. The **analysis results revealed** that cultural adaptation, communication quality, and trust have positive effects on the performance of virtual teams.

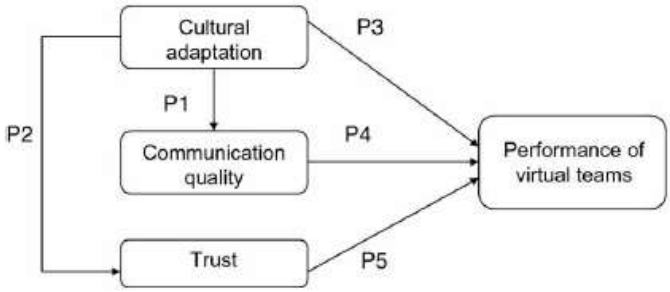


Figure 3.6: Conceptual Framework containing cultural adaptation, communication and trust

This model proved a positive role of trust on the performance of the teams. The emergence of trust also gets affected by the cultural diversity of the teams.

3.2.7 Garrison, G. et al., (2010) studied the model shown in figure 3.7 and empirically tested the effect of perceptions of diversity on trust, cohesion, and individual performance in actual globally distributed teams. A quantitative **methodology** was used where data was collected through online survey. The results **indicated** that individual productivity is negatively influenced by the extent of diversity within a team; however, this liability may be restrained if an environment of trust is encouraged and team cohesion develops.

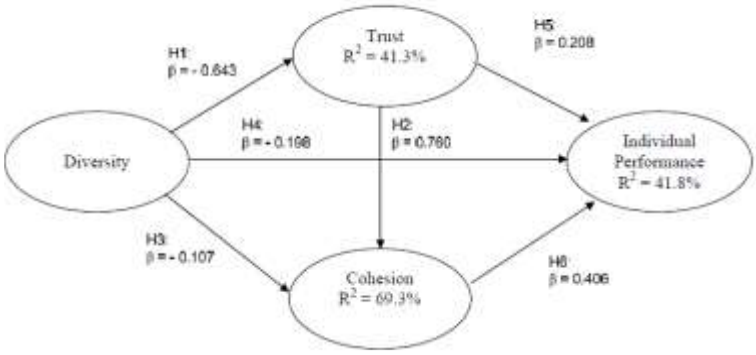


Figure 3.7 : Research Model of Diversity and individual performance in globally distributed teams

The model proved that the trust in the teams affect the performance of individuals positively. However, the diversity leaders to negative performance of the individuals.

3.2.8 Martins, L. L., Gilson, L. L., & Maynard, M. T. (2004) **reviewed the research** on virtual teams in an effort to assess the state of the literature. They started with an examination of the definitions of virtual teams used and proposed an integrative definition that suggests that all teams may be defined in terms of their extent of virtualness. Next, they reviewed findings related to team inputs, processes, and outcomes, and identify areas of agreement and inconsistency in the literature on virtual teams. The **methodology** followed by the authors is extensive review of empirical articles in peer-reviewed journals for inclusion in the review of findings. A total of 93 empirical articles were included in the review. Of these, 66 were lab studies, 13 used "real teams"; and 14 were case studies.

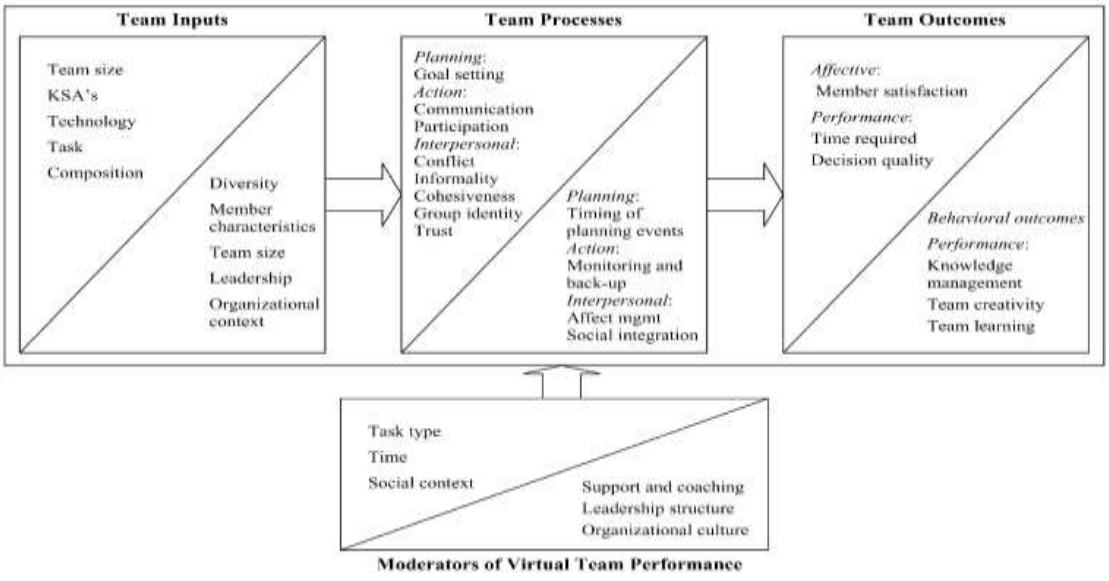


Figure 3.8: I - P –O Model of Virtual Team Functioning

Based on this review, they **suggested avenues for future research**, including methodological and theoretical considerations that are important to advancing their understanding of virtual teams as shown in figure 3.8. This IPO model became foundation for many future researched on virtual teams. It indicated the various components that affect team processes, team inputs and team outcomes.

The following table 3.1 shows the summary of 15 models depicting the effects of trust on performance.

Table 3.1: Summary of models showing effects of Trust on Performance

S.no.	Author/ Year	Paper Name	Journal/ Conference/ Article	Purpose	Team/ Team size	Methodology Used	Students/ Non Students
1	Sridhar, V. & Paul, R., 2006., 2001	Analyzing factors that affect performance of global virtual teams.	http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.105.1596pp.159–170.	VT factors on Performance(2-7 weeks)	57 students from 14 groups of 3-5 students	Lab setting/ Survey	MBA students
2	Lurey, J., & Raisinghani, M., 2001.	An empirical study of best practices in virtual teams.	Information & Management	Virtual team survey	67 individuals of 12 teams	-	8teams of high tech, agriculture
3	Hsin Hsin, C., Shuang-Shii, C. & Shu Han, C., 2014.	Determinants of cultural adaptation, communication quality, and trust in virtual teams' performance.	Total Quality Management & Business Excellence, 22(3), pp.305–329.	Performance	4 virtual teams from Taiwan Organization	Semi structured Interviews	Taiwan Organization
4	Garrison, G. et al., 2010.	Globally distributed teams: the effect of diversity on trust, cohesion and individual performance.	ACM SIGMIS Database, 41(3), pp.27–48.	Performance	78 individuals in 18 global team projects of 4-5 teams	Online survey questionnaire	Undergraduate students
5	Saxena, A. & Burmann, J., 2014.	Factors Affecting Team Performance in Globally Distributed Setting.	ACM, pp.25–33.	Performance	Study of Global virtual Teams	SEM Methodology	Students
6	Prasad, K. & Akhilesh, K.B., 2002.	Global virtual teams : what impacts their design and performance ?	Team Performance Management : An International Journal, 8(5/6), pp.102–112.	Performance	Literature review		
7	Martins, L. L., Gilson, L. L., & Maynard, M. T. , 2004	Virtual Teams: What Do We Know and Where Do We Go From Here?	Journal of Management,	-	Review on Virtual Teams and study on Input -Process Outcome- model	Lab studies + case studies	-
8	Hertel, G.,	Managing virtual teams: A	Human Resource	Summarize the	-	Exploratory study	-

	Geister, S. & Konradt, U., 2005.	review of current empirical research	Management Review, 15, pp.69–95.	available empirical research. Management of VT		+case study+ Quantitative Research	
9	Pinjani, P. & Palvia, P., 2013.	Information & Management Trust and knowledge sharing in diverse global virtual teams.	Information and Management, 50, pp.144–153.	Performance	58 Global Virtual Teams; 4 per team from Industry	Questionnaire; Hierarchical Multiple Regression Technique	Employees
10	Wakefield, R.L., Leidner, D.E. & Garrison, G., 2008.	A model of conflict, leadership, and performance in virtual teams.	Information Systems Research, 19(4), pp.434–455.	Trust (less than 1 year)	159 virtual team members…large size	Questionnaire; SEM	Industry- 5 Korea Firms of Construction, Finance and Business
11	Jong, B. De & Elfring, T., 2010.	How does trust affect the performance of ongoing teams? The mediating role of reflexivity, monitoring, and effort.	Academy of Management Journal, 53(3), pp.535–549.	Performance	565 tax consultants of Dutch Tax department; 73 teams – 8 team members each	Questionnaire ; Ordinary Least Squares	Employees
12	Lin, C., Standing, C. & Liu, Y., 2008.	A model to develop effective virtual teams.	Decision Support Systems, 45, pp.1031–1045.	Performance	200 undergraduate students; 25 teams with 8 members	Survey and experiment	Students
13	Powell, A., Piccoli, G. & Ives, B., 2004.	Virtual Teams : A Review of Current Literature and Directions for Future.	The DATABASE for advances in Information Systems, 35(1), pp.6–36.	Literature Study of IPO MODEL	-	Exhaustive review of 43 papers	Students
14	Ebrahim, N.A., Ahmed, S. & Taha, Z., 2009.	Virtual teams: a literature review.	Australian Journal of Basic and Social Sciences 3(3), pp.2653–2669.	Performance	Study	Exhaustive review of peer reviewed journals	-
15	Furst, S., Blackburn, R. & Rosen, B., 1999.	Virtual team effectiveness : a proposed research agenda.	Information Systems Research, 9, pp.249–270.	Performance	Literature Study	-	-

3.3 Models depicting the factors affecting the trust

The researcher analysed 20 models showing the different factors affecting the trust. Based on their relative importance, the researcher is providing summary of only 10, the data of rest of the models is included in the table 3.2 followed by the summary. This section provided insights to the researcher about the factors affecting the trust in virtual project teams.

3.3.1 Rusman, E. et al. (2010) in their paper title, "Fostering trust in virtual project teams : Towards a design framework grounded in a TrustWorthiness ANtecedents (TWAN) schema" **explained** why virtual project teams develop interpersonal trust in a different way compared with face-to-face teams. **:** The cognitive model for the formation of trust was proposed after reviewing research literature and it consists of three parts: input, which is observable; a cognitive process, which cannot be observed directly; and output, the observable outcomes of the cognitive process. **Both the theoretical and empirical literature from** different domains (e.g. management, psychology) as well as contexts (e.g. private as well as professional) was reviewed on trust and trustworthiness antecedents to design a schema of trustworthiness.

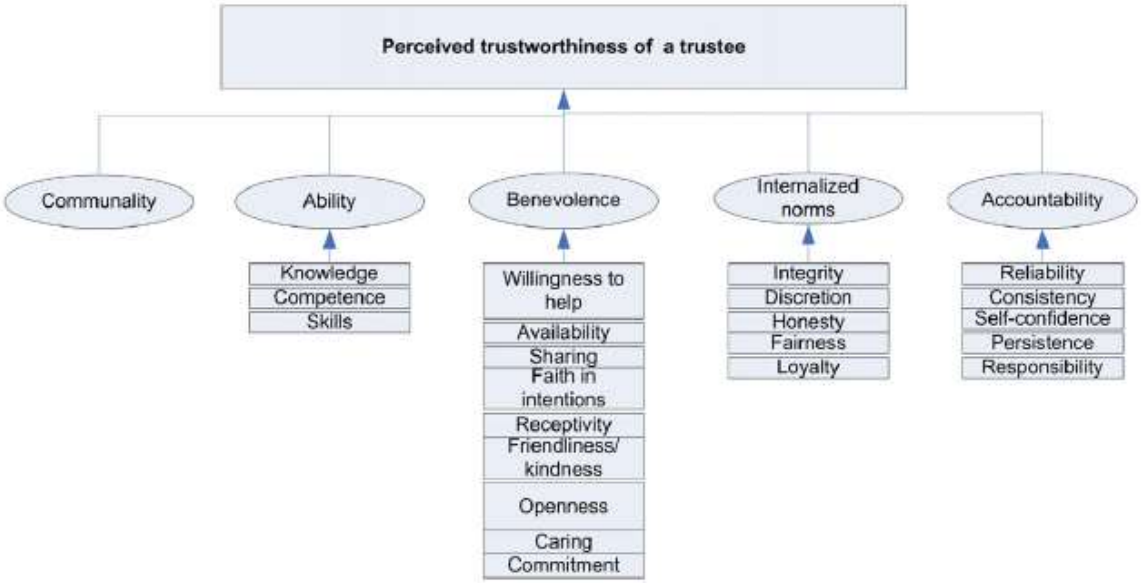


Figure 3.9 : The Trustworthiness Antecedent schema(TWAN)

The **findings** as shown in figure 3.9 resulted into a detailed schema of the antecedents of trustworthiness called the Trust- Worthiness ANtecedents (TWAN) schema. This schema is a first step towards the development of a design framework which could be used to determine the type of personal information that is important for team members to have available.

The schema showed the importance of team member characteristics such as ability, benevolence, accountability, communality as the factors which effect the trust building in the virtual project teams.

3.3.2 Curşeu, P.L. & Schruijer, S.G.L., (2010) **explored** the interplay between trust and conflict as antecedents of team effectiveness. They tested in a cross-sectional study, the extent to which the impact of two forms of diversity, (gender and nationality) on team effectiveness is mediated by trust and task conflict. They tested two alternative models exploring the interplay between trust and conflict in teams. In the first model, trust was conceptualized as an antecedent for intra-team conflict, and in the second, task and relationship conflict were conceptualized as antecedents of trust. In the first cross-sectional study, two alternative path models are tested in a sample of 174 teams (897 participants) with the emergent states of task conflict, relationship conflict, and trust acting as mediators between team demographic diversity (gender and nationality) on the one hand and perceived team effectiveness on the other. In one model, trust is considered as an antecedent for the two types of conflict, while in the other model, the two types of conflict precede the emergence of trust. The interdependence of trust and conflict was further explored in a second longitudinal study (49 teams), and the results showed that trust emerging in the initial team interaction phases is a good predictor for the emergence of both task and relationship conflict in further stages of team development. The theoretical arguments were **summarized** in the models presented in figure 3.10. The figure contains two models, the difference referring to the role of trust. In Model A, trust is an antecedent for task and relationship conflict, and in Model B, trust is a consequence of both task and relationship conflict.

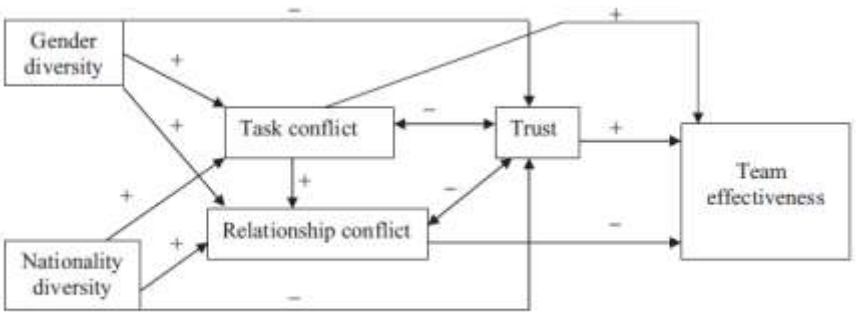


Figure 3.10: Model showing effect of Gender and nationality diversity and conflict on trust.

The model showed that trust and conflict within the teams are interconnected to each other. It pointed out that trust gets negatively influenced by the conflicts in the teams. And if the teams are diverse in nature, then gender and nationality diversity negatively effects the trust in the teams.

3.3.3 Zolin, R., Hinds, P., Fruchter, R., & Levitt, R. (2004) **established** analytically that the antecedents of trust are different in cross-functional, geographically distributed work than in more traditional uni-functional, collocated settings. They modified the Mayer, Davis and Schoorman model of organizational trust to reflect the context of cross-functional, geographically distributed work in their integrative model of organizational trust as shown in figure 3.11. Certain Hypothesis was proposed.

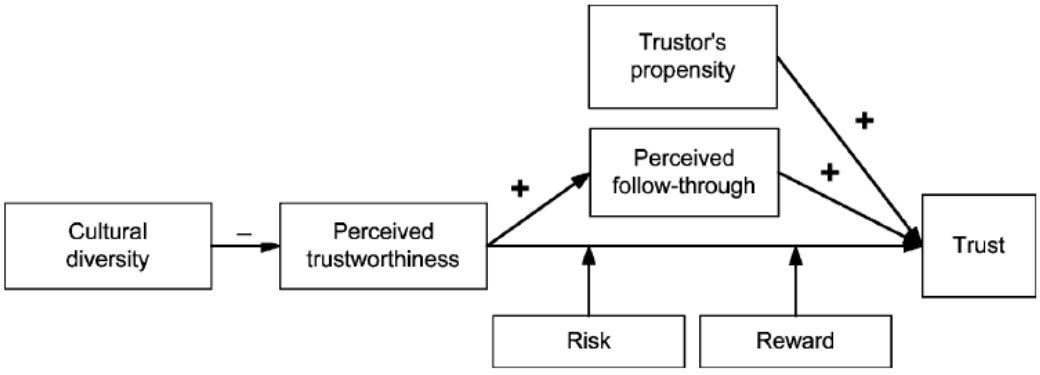


Figure 3.11: The proposed model of interpersonal trust in cross- functional global work

They tested their hypotheses by conducting a longitudinal study of architecture, engineering and construction management students engaged in designing and planning a $5 million construction project in distributed teams. The **results showed** the importance

of building rapport and trust early in a project. In particular, it is required to create an environment in which team members can evaluate one another's perceived trustworthiness (benevolence, ability, and integrity). Second, the findings suggested that trust, once established, may be fairly stable in cross-functional, global work. If high levels of trust are established early in the development of the partnership, this may be beneficial.

The model proved that challenging nature of work and proper rewarding policies results in building up of trust in globally distributed virtual teams. The trust developed initially during the start of the project usually remains stable throughout the project tenure. Also the cultural diversity affects negatively on the building of trust in teams.

3.3.4 Staples, D., & Ratnasingham, P. (1998) **studied** trust between managers and employees that can potentially enhance employee effectiveness by reducing uncertainty and increasing satisfaction and commitment. To study this, employees' perceptions of interpersonal trust between themselves and their manager in both virtual management and non-virtual management environment were quantitatively examined (n = 631). They developed and tested a simple model of the outcomes of the employees' perceptions of trust between themselves and their managers as shown in figure 3.12, with both remote employees and non-remote employees. They then compared the results for the two groups of respondents. The **methodology** used was quantitative in nature. A questionnaire was sent to 1,343 individuals working in 18 North American organizations that (1) employed individuals who worked remotely from their managers and (2) were interested in participating in the study.

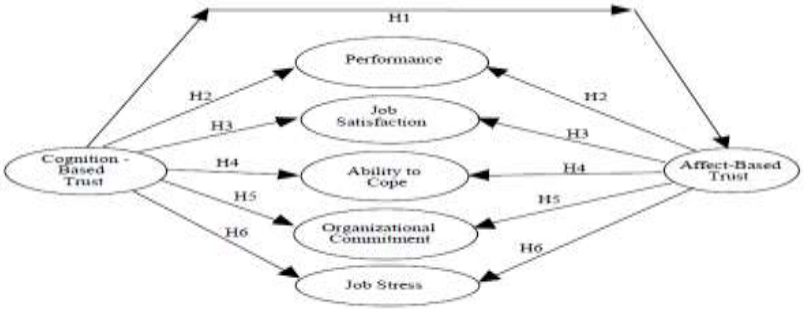


Figure 3.12: The research model showing effect of uncertainty, satisfaction and commitment on trust

The **results suggested** that, contrary to many suggestions in the literature, trust has less impact for remote workers than it does for non-remote workers on key variables such as job satisfaction and job stress. It has also shown that cognition-based trust is more important than affect-based trust in a remote setting.

The findings suggested that professionalism, competence and ability of team members increase the building up of trust in the virtual teams. The affect –based trust also called emotional trust comparatively affects the team members lesser than the cognitive based trust. The job stress and level of satisfaction of the team members also affect the trust negatively.

3.3.5 Fang, Y.-H., & Chiu, C.-M. (2010) **focused** on the major challenge in sustaining a VCoP of acquiring knowledge spontaneously from members. In this study, they integrated three research streams—justice, trust, and organizational citizenship behaviors (OCB) - into one model as shown in figure 3.13 in order to analyze the antecedents of knowledge-sharing continuance intentions in VCoPs. Based on literature review, certain hypotheses were developed. The quantitative **methodology** was used in order to test the model proposed. A questionnaire was distributed among 142 IT professionals of various VCoP in Taiwan.

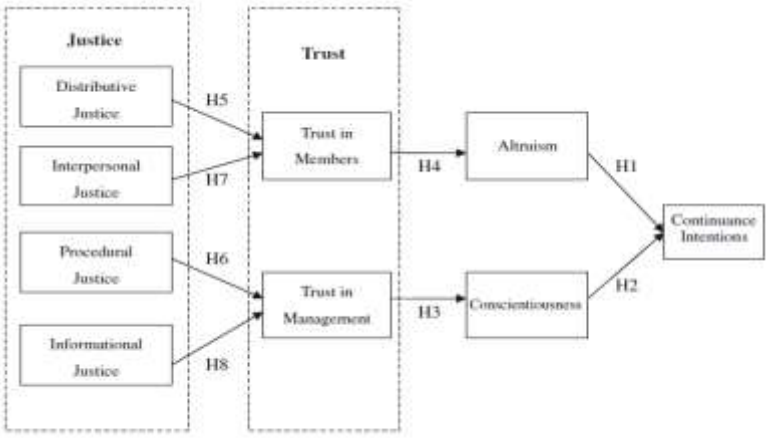


Figure 3.13 : Research model showing the effect of justice on trust

The findings indicated that distributive justice and interpersonal justice have a positive impact on trust in members, whereas procedural justice and informational justice have a positive impact on trust in management in the VCoP context.

The research model suggested that trust strongly build on the organizational policies of team evaluation. The transparent policies of team evaluation and mentoring of the teams greatly enhances the trust in the virtual project teams.

3.3.6 Kuo, E. W., & Thompson, L. F. (2014**) investigated** the effects of social network information, specifically the presence of a shared social tie, on the formation of trust amongst new virtual collaborators as shown in figure 3.14. A **mix of qualitative and quantitative methodology** was being used. Data from 74 participants were collected to test a path analytic model predicting that social ties and propensity to trust influence perceptions of a new teammate's trustworthiness (ability, benevolence, and integrity) as well as the willingness to trust that new teammate when given the opportunity to do so.

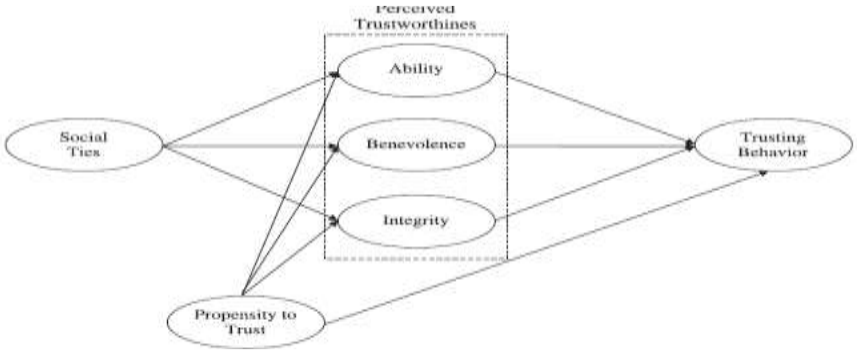


Figure 3.14 : Model depicting relationship between social distance and initial trust in a new teammate

The **findings of the study showed** no significant evidence that social ties or propensity to trust affect perceived trustworthiness at the initial point of team engagement. Additionally, only one component of perceived trustworthiness (perceived ability) and propensity to trust were found to predict trusting behaviour towards a new, unknown, teammate.

The model claimed that team mates' willingness to trust depends on the ability of the co-worker. The bonding which gets developed in earlier stages of team development actually affects positively on the building of trust in the teams.

3.3.7 Park, J., & Lee, J. (2014) showed the understanding of the behavioural mechanism that encourages project partners to share knowledge in IS development projects. They wanted to know critical antecedents for building trust and dependence in IS development projects that may lead to knowledge sharing and team performance and the roles of trust and dependence in this behavioural mechanism. Certain hypotheses were proposed.

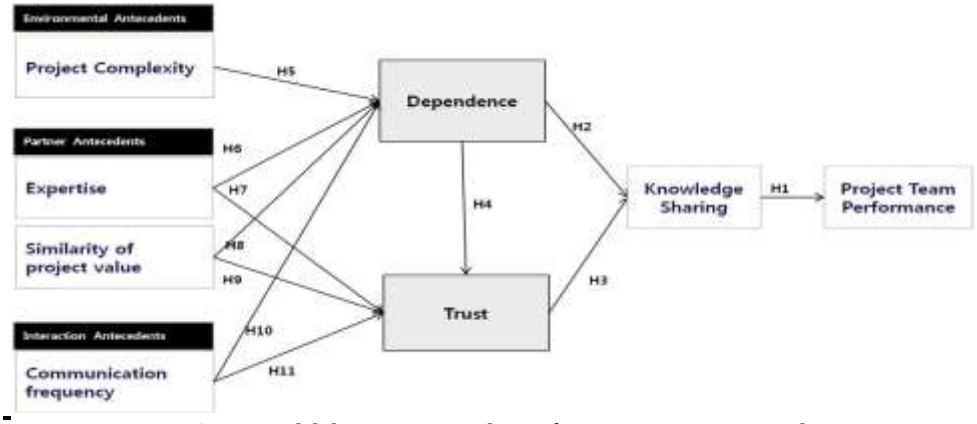


Figure 3.15 : Model depicting antecedents of environment, partner and interation on trust

The **methodology** used was quantitative in nature. Data were collected from project leaders of two major Korea IT companies. The **findings** resulted in a model as shown in figure 3.15 indicate that team members share their knowledge when they trust their partners and when they feel dependent. Feelings of dependence and trust are influenced by the communication frequency, perceived similarity of the project's value, and the perceived expertise.

The model was developed for Information Science projects handled by virtual project teams. These projects demand creative efforts that involve in-depth exchange of expertise and insights among partners. The trust gets greatly influenced by the frequency of communication, complexity of the project and on degree of similarity among the projects.

3.3.8 Jarvenpaa, S. L., Knoll, K., & Leidner, D. E. (1998) **explored** the antecedents of trust in a global virtual-team setting. This study explored, in a virtual-team setting, the effect of factors that have been identified as sources of trust in traditional face-to-face relationships. Certain hypotheses were suggested for the research. The **methodology** used was of lab exercises given to university students**.** The students from twenty eight universities were charged with completing three tasks: two team-building exercises and a final project.

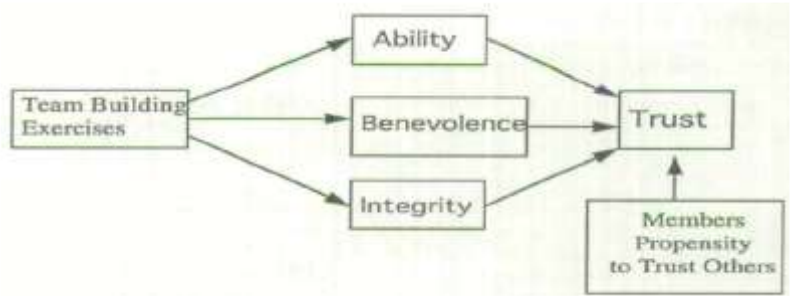


Figure 3.16 : A research Model showing the effect of ability, benevolence and integrity on trust

The **findings** showed that in the early phases of teamwork, team trust was predicted strongest by perceptions of other team members' integrity, and weakest by perceptions of their benevolence. The effect of other members' perceived ability on trust decreased over time. The members own propensity to trust had a significant, though unchanging, effect on trust as shown in figure 3.16.

The model of trust showed that team member's characteristics greatly affect the teamwork and trust. The integrity and ability of the team members positively affect the trust whereas the benevolence does not affect the trust building of the virtual teams.

3.3.9 Mitchell, A. & Zigurs, I., (2009) **provided** an in-depth understanding of the aspects of trust in virtual teams by presenting a comprehensive analysis of existing research on trust in virtual teams. They **reviewed** theories, methods, tasks, technologies, and major outcome themes from 42 empirical studies over an eleven year period from 1997 through 2007. The analysis **revealed** gaps and areas for future research, including the need for additional use of methods for deliberating interventions that will enhance trust.

They first **presented** a multidimensional view of trust that emerged from the studies that they analysed, followed by a trust framework as shown in figure 3.17 based on inputs, processes, and outputs that were influential in these studies, and a discussion of key findings in the context of the framework.

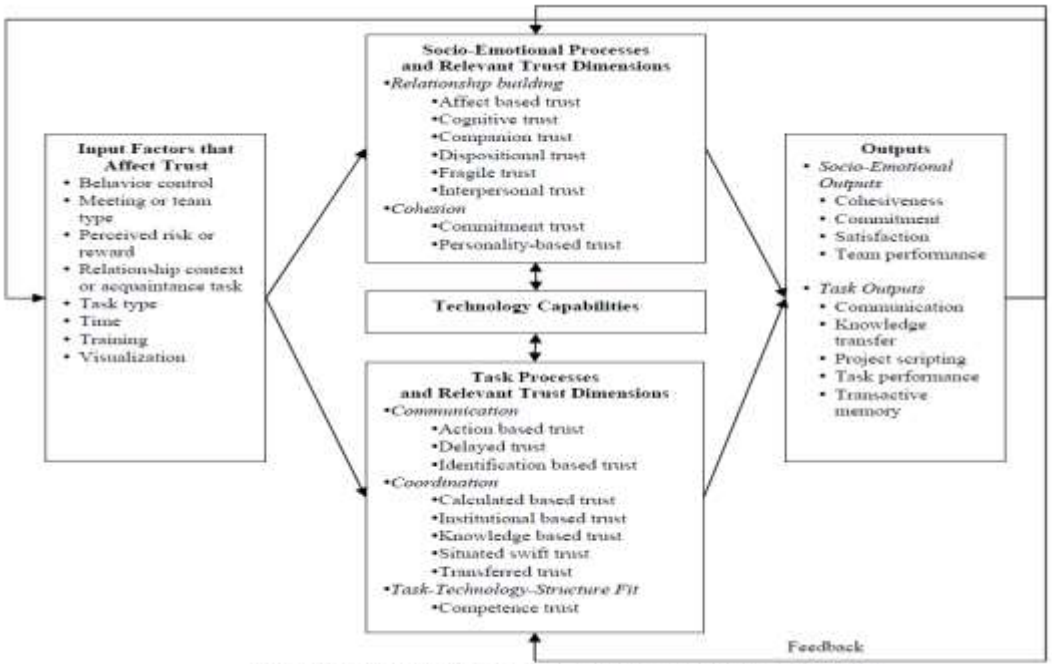


Figure 3.17 : Framework for Research on Trust in Virtual Teams

The framework of research showed that there are some input factors such as trainings, team size, rewarding structures, and interdependencies of the task that affect the performance, commitment and trust of the teams. In addition to this, the factors such a relationship building, cohesion, communication, coordination and task- technology fit affect the knowledge sharing between the virtual project teams leading to building of trust.

3.3.10 Piccoli, G. & Ives, B., (2014) reported the findings of a longitudinal study of temporary virtual teams and explored the role of behaviour control on trust decline. Certain hypotheses were formed. The authors conducted an experiment involving 51 temporary virtual teams. Half of the teams were required to comply with behaviour

control mechanisms traditionally used in collocated teams. Their counter-parts were allowed to self-direct. A total of 201 graduate (89%) and undergraduate (11%) students from six schools in the United States, Europe, and New Zealand were involved in the research.

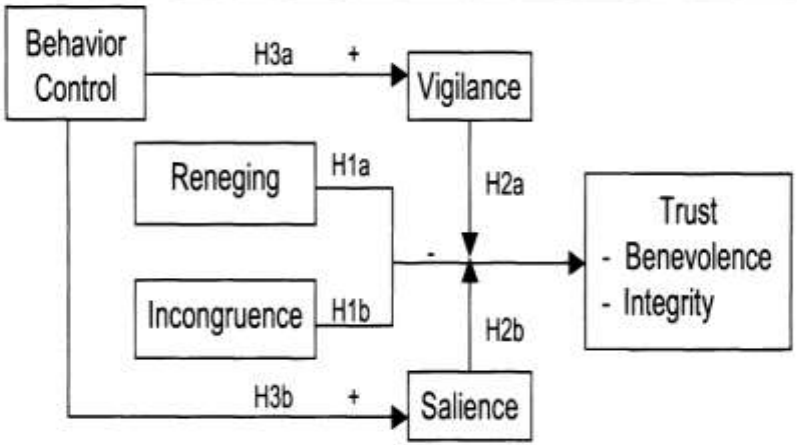


Figure 3.18 : A research model depicting the effect of control mechanism on trust

The analysis as shown in figure 3.18 showed that the behaviour control mechanisms typically used in traditional teams have a significant negative effect on trust in virtual teams. In-depth analysis of the communication logs of selected teams reveals that trust decline in virtual teams is rooted in instances of reneging and incongruence. Behaviour control mechanisms increase vigilance and make instances when individuals perceive team members to have failed to uphold their obligations (i.e., reneging and incongruence) salient.

This research model proved that very close and tight monitoring of teams actually effects the trust negatively. The increased vigilance results in the decline of trust as it detects the team members' failure to fulfil their obligations and task.

The following table 3.2 shows the summary of 20 models showing the different factors affecting the trust.

Table 3.2: Summary of models showing factors affecting Trust

S. No.	Author/ Year	Paper Name	Journal/ Conference/ Article	Trust/ Other	Team/ Team size	Methodology Used	Students/ Non Students
1	Jarvenpaa, S.L., Knoll, K. & Leidner, D.E., 1998.	Is Anybody Out There? Antecedents of Trust in Global Virtual Teams.	Journal of Management Information Systems, 14(4), pp.29–64.	Trust(8 weeks)	385 Master students	Team Building Exercises; Archival Mail Messages	Master students
2	Ridings, C.M., Gefen, D. & Arinze, B., 2002.	Some antecedents and effects of trust in virtual communities.	Journal of Strategic Information Systems, 11, pp.271–295.	Trust (10 days)	36 Virtual Communities	Survey-Cross-sectional	Virtual Communities
3	Thomas, D. & Bostrom, R., 2008.	Building Trust and Cooperation through Technology Adaptation in Virtual Teams: Empirical Field Evidence.	Information Systems Management, 25(1), pp.45–56.	Trust	13 team leaders of VT	Interviews	Employees
4	Uden, L., & Naaranoja, M., 2007.	The development of online trust among construction teams in FINLAND.	ITCON.ORG.	Trust	168 Employees of 3 different Finnish Towns	Interviews	Four Construction projects in Finland
5	Curşeu, P. L., & Schruijer, S. G. L. ,2010	Does conflict shatter trust or does trust obliterate conflict? Revisiting the relationships between team diversity, conflict, and trust	Group Dynamics: Theory, Research, and Practice, 14(1), 66–79. doi:10.1037/a0017104	Trust	174 Teams (897 Participants)	AMOS SEM	Students from Dutch University
6	Mitchell, A., & Zigurs, I., 2009.	Trust in virtual teams: solved or still a mystery?	ACM SIGMIS Database, 40(3), 61–83.	Trust, Performance	42 empirical studies	-	-
7	Zolin, R. et al., 2004.	Interpersonal trust in cross-functional, geographically distributed work: A longitudinal study.	Information and organization, 14, pp.1–26.	Trust (4 month project)	12 teams of 3-4 each, students from architecture and construction discipline	Online Survey	Management students

8	Park, J. & Lee, J., 2014.	Knowledge sharing in information systems development projects : Explicating the role of dependence and trust.	International Journal of Project Management, 32(1), pp.153–165.	Knowledge sharing and trust(1 year)	139 employees of 2 major Korean IT companies	Questionnaires ; SEM	Employees
9	Kuo, E. & Thompson, L., 2014.	The influence of disposition and social ties on trust in new virtual teammates.	Computers in Human Behavior, 37, pp.41–48.	Trust	74 participants of Linked In users from 3 sources	Qualitative and Quantitative	Linked in-Online users
10	Fang, Y. & Chiu, C., 2010.	In justice we trust: Exploring knowledge-sharing continuance intentions in virtual communities of practice.	Computers in Human Behavior, 26, pp.235–246.	Trust	142 members from IT oriented VCOP in Taiwan	Questionnaires ; SEM	Virtual communities
11	Mcallister, D.J., 1992.	Affect- and Cognition-based trust as foundations for interpersonal cooperation in organizations.	Academy of Management Journal, 38(1), pp.24–59.	Trust	194 Managers and Professionals	Questionnaire; SEM (LISREL 7)	Employees
12	Staples, D. & Ratnasingham, P., 1998.	Trust: the panacea of virtual management?	ICIS ’98 Proceedings of the international conference on Information systems, pp.128–144.	Trust	631 employees of North America	Questionnaire	Employees of 19 North American Organizations
13	Porter, C. E. (2008).	Cultivating Trust and Harvesting Value in Virtual Communities.	Management Science	Trust	663 customers	SEM	Virtual Communities
14	Askay, D. a. & Spivack, A.J., 2010.	The Multidimensional Role of Trust in Enabling Creativity within Virtual Communities of Practice: A Theoretical Model Integrating Swift, Knowledge-Based, Institution-Based, and Organizational Trust.	43rd Hawaii International Conference on System Sciences, pp.1–10.	Trust	Literature review to propose a model		Virtual Communities

15	Riedl, B.C., Gallenkamp, J. V. & Picot, A., 2013.	The Moderating Role of Virtuality on Trust in Leaders and the Consequences on Performance.	46th Hawaii International Conference on System Sciences, pp.373–385.	Trust	121 participants	Online Questionnaire	Employees of companies in Germany and Europe
16	Pierce, E. & Hansen, S., 2013.	Technology, Trust and Effectiveness in Virtual Teams.	The International Journal of Management and Business, 4(1), pp.33–62.	Trust	873 Engineers of 4-9 Members each	Survey; SEM	3500 Virtual Teams of U.S. Department of Defence
17	Bao, G.M. et al., 2004.	The dilemma of trust and commitment in the construction of innovative team in Chinese private enterprises.	2004 IEEE International Engineering Management Conference (IEEE Cat. No.04CH37574), 1, pp.412–416.	Trust	108 Chinese Private Enterprises	Interviews	Employees
18	Aubert, B. & Kelsey, B., 2003.	Further understanding of trust and performance in virtual teams.	Small group research, 34(5), pp.575–618.	Trust (3 months)	71 students in 3-4 teams	Questionnaires	Business Students of 2 Canadian university
19	Powell, A., Piccoli, G. & Ives, B., 2004.	Virtual Teams : A Review of Current Literature and Directions for Future.	The DATABASE for advances in Information Systems, 35(1), pp.6–36.	Trust	51 Temporary virtual teams	Lab Experiment	Undergraduates students from schools of US, Europe and New Zealand
20	Dayan, M. , & Benedetto, C. Di ,2010	The impact of structural and Contextual factors on trust formation in Product Development teams	Industrial Marketing Management	Trust	93 Product Development Project teams	Questionnaire ; SEM	Employees

3.4 Summary

This chapter discussed the two different kinds of models of trust and performance. First, there was discussion on various models depicting the effect of trust on performance and secondly, there were different models showing the factors affecting the trust in virtual project teams. This discussion of models helped researcher to know the various kinds of factors involved in trust building in virtual project teams in other sectors of different countries. This act as a base to find how these factors affects the trust building in virtual project teams in construction sector of Middle East. Also the study of these models helped the researcher understand the methodology to be used for the research. It gave insights into what is actually happening in the area of virtual project teams' literature.

In the next chapter, more focused literature review findings are discussed. Considerable numbers of research articles were reviewed to identify indicators responsible for Trust in Virtual Project teams. The analysis of the review findings was responsible for the identification of 40 such indicators. The next chapter explains each and every one of the 40 indicators and references them to a substantial number of published research works. The next chapter also introduced the construction of research hypothesis and theoretical model of Trust.

Chapter 4

Virtual Project Teams' Trust Indicators and Construction of Research Hypotheses

4.1 Introduction

This section attempts to describe the review of literature which was extensively done to identify the indicators (variables) that were included in the research framework. Research articles from reputed peer-reviewed journals, conferences and other research repositories were identified after broad search on basis of appropriate keywords. The shortlisted articles were then procured through the respective databases, some of them by providing SOLAR login authentication for the University of Salford, others by downloading free of cost and the remaining few by requesting the concerned authors/researchers. The previous chapter 3 provided many models to help understand the researcher the role of trust in the performance of virtual project teams. Further these models of section 3.3 also helped in providing the different indicators (variables) affecting the trust in virtual project teams. A total of 149 research articles were reviewed and methodically analyzed to identify 40 indicators for the research framework.

4.2 Indicators affecting Trust in Virtual Project Teams

The identified indicators are – *Team Size, Respect, Recruitment Strategy, Reward plan, Communication, Employee satisfaction, Network Security, Training, Clear Objectives, Task Complexity, Task- Technology fit, Diversity, Cultural Barriers, Language Barriers, Ability, Integrity, Benevolence, Propensity to trust, Risk, Knowledge sharing, Cognitive elements, Affective elements, Group Cohesiveness, Perceptions of the process, Decision Quality, Decision Quantity, Conflict, Group Heterogeneity, Leadership, Organizational resources, Team reflexivity, Team Effort, Team monitoring, Time difference and holidays, Team Evaluation, Organizational Culture, Motivation, Task Interdependence, Satisfaction of outcomes and control variables such as project length, age, gender, work experience, comfort with computers.* Each of the 40 indicators has been cited in various research articles and many researchers have commented on the importance of such indicators with respect to the building trust in a virtual project team.

The following list represents the most important indicators that influence trust in virtual project teams:

1. **Team Size**: Team size is defined as the number of primary team members. It has been related to the amount of communication that transpires among team members (Ancona & Caldwell, 1992). The optimal team size depends on several factors such as number of people required to complete a task and the amount of coordination needed to work together. Amah, Nwuche, & Chukuigwe, (2013) suggested that normally, teams are expected to be large enough to provide all the necessary skills and competencies and also small enough to be coordinated efficiently. The advantages of small teams are that they can be easily coordinated. The team members of small teams tend to be more satisfied, motivated and committed. Information sharing is easily possible and individual contribution of the members can also be felt. On the other hand, the bigger teams need to have more coordination, have low level of motivation, needs to be monitored continuously to resolve conflicts.

2. **Respect:** Respect has been defined in the literature with two notions – first it refers respect towards team members and second it seems to be associated with the respect to the technology**.** Naha, Mansor, & Mirahsani, (2012) showed through his analysis that feelings of trust in terms of respect were significantly higher within teams than between teams. The respect among the team members develop gradually through their association. They also figured out that team members appeared to have little respect for the technology, neither were they generally committed to it. The team members' level of confidence and respect towards technology depends on the quality of interaction with the technology.

3. **Recruitment Strategy**: The selection of teams is the deciding factor between successful teams and unsuccessful ones. Amah, Nwuche, & Chukuigwe, (2013) believed that members of teams are first members of organizations before they become members of teams. The selection criteria an organization uses, therefore affects the type of people that will be in teams. Bell and Kozlowski, (2002) proposed that the virtual teams should be designed in such way so that the suitable people for the projects form the teams. Virtual team leaders need to select members with necessary skills and competencies as a

first priority. The clear scope of the project, outcomes priorities and supportive team climate forms the second part in the construction of virtual project teams (Hunsaker & Hunsaker, 2008). Bal and Gundry, (1999) analyzed and found that the selection of virtual team members is particularly difficult because of the geographical and organizational separation involved.

4. **Reward plan**: The organizations are required to see that a fair and motivating reward system is in place at the beginning of virtual teamwork (Bal & Teo, 2001b, Hertel et al., 2005). It is very important to recognize and reward virtual team performance (Bal & Gundry, 1999). Naha, Mansor, & Mirahsani, (2012) proposed that teams' performance improves when the reward is based on individual and team performance. The team leaders can appreciate teams in company newsletters, inscribing team's name on T-shirts, mugs, umbrellas etc., or monetarily to give team members a sense of identity. The reward system should be designed in such a way that it should tend towards encouraging cooperative efforts rather than competitive effort.

5. **Communication:** The communication among virtual team members can be either Synchronous (Chat, Net meeting) or Asynchronous (email, electronic bulletin boards). The communication quality is the degree to which the content of the communication is received and understood by the other party in the relationship. According to Crampton, (2001), the communication becomes a challenge in virtual environment. This is primarily due to time delays in sending feedback, lack of a common frame of reference for all members, differences in salience and interpretation of written text, and assurance of participation from remote team members. Piccoli, et al (2004) analyzed team member communication and indicated that effectiveness of virtual teams depend on the nature of coordination and communication. As per studies by Carvalho (2008), there are mainly three barriers to communication in a project. These are (1) language barriers, (2) differences in perception and (3) lack of a project communication plan. If the project managers are successful in controlling these aspects, then it results in the trust building among the team members and hence results in the successful completion of the project.

6. **Employee satisfaction**: It is related to the attitudes of the group members towards one another. The satisfaction among the group members increases with their positive attitude towards each other. Bryant, Albring, & Murthy, (2009) proposed that in a virtual team environment, team members' satisfaction also depends on the kind of communication technology used. The satisfaction is higher when a rich technology medium is used vis-à-vis a lean technology medium. Also employee satisfaction largely depends on reward structure employed in the organization.

7. **Network Security:** The network security is an issue in virtual organizations as there is lot of information that gets exchanged through internet. There needs to have manipulation of sensitive information and data through the web, therefore security is always an important issue of concern (Bal and Teo, 2001c). According to Hunsaker & Hunsaker, (2008), team leaders should identify the special technological and security level needs of the virtual team and their team members

8. **Training:** Amah, Nwuche, & Chukuigwe, (2013) suggested that the training makes employees good team players as it helped them to acquire skills and experiences. The training also could allow employees to experience the satisfaction that teamwork can provide. The training could be in the form of workshop to help employees improve their problem solving, communication, negotiation, conflict management, and coaching skills. Fuller et al., (2006b) results indicated that in the case of computer collective efficacy, computer training related to more advanced skills sets may be useful in building virtual team efficacy. Hertel et al. (2005) suggested that the training led to increased cohesiveness and team satisfaction. Bal & Teo, (2001c) proposed that the training should include self-managing skills, communication and meeting training, project management skills, technology training, etc.

9. **Clear Objectives**: The organizational culture should mention clear roles and accountabilities to the virtual team members. Massey et al., (2003) believed that virtual team members feel less accountable when there is lack of visibility of the goals.

Temporal coordination mechanisms such as scheduling deadlines and coordinating the pace of effort are recommended to increase vigilance and accountability. Amah, Nwuche, & Chukuigwe, (2013) found that goal setting improves performance by stretching the intensity and persistence of employee effort. The virtual team members channelize their behaviors' towards improved work performance when they have clearer role perceptions.

10. **Task Complexity:** The teams become more effective when they have clearly well-defined tasks rather than when they have unclear and ill-defined tasks (Amah, Nwuche, & Chukuigwe, 2013). Tesluk, Mathiue, Zaccaro, & Marks, (1997) remarked that the less complex tasks can be done sequentially with asynchronously communication. In these situations, asynchronous communication such as email or screen sharing will usually be sufficient because the need for reciprocal communication and interdependence is minimal (Bell & Kozlowski, 2002, p. 24). The highly complex tasks require synchronous communication and collaboration between the team members. As tasks grow in complexity, however, there is a need for more coordination with richer form of communication including real-time feedback (Hollingshead, McGrath & O'Connor, 1993)

11. **Task- Technology fit:** Dakrory & Abdou, (2009) found that different tasks are involved at different levels of projects. It needs to have appropriate technologies which are required to evaluate the complexity of the various tasks. The individual preferences, experience with the technology and its ease of use decides the choice of technology. The teams become more effective when they are able to adapt the technology and match it to the communication requirements of the task at hand (Maznevski & Chudoba, 2001; Powell et al., 2004).

12. **Diversity:** Jackson, Stone, & Alvarez (1992) use the term diversity to refer to situations in which the team members are dissimilar with respect to some attributes. Lau & Murnighan (1998) conceptualized diversity in terms of the heterogeneity of individual attributes within a group. These definitions imply that diversity is a relative concept in

that an individual is diverse only in relation to other individuals (Austin, 1997). Along these lines, researchers often use two kinds of diversities. Demographic diversity relates itself to individual differences such as race, gender, ethnicity and nationality. The higher the diversity within a team, the higher the probability that team members will engage in different forms of conflict (Pelled, 1996). Functional diversity (Milliken & Martins, 1996) involves a range of functional assignments. The performance of the teams gets negatively affected with the functional diversity as it involves differences of opinion and perspectives (Bunderson & Sutcliffe, 2002).

13. **Cultural Barriers:** Vinaja (2003) proposed that virtual teams must recognize discrepancies between cultures in order to work efficiently and effectively. For example, Americans have a "need for speed", they like fast responses. In other cultures, such as the Japanese, this form of communication collides with their work ethic. The Japanese are correct and proper, expecting to carefully craft their responses, and the idea of a written message devoid of nonverbal, social and grammar is an incomplete message (Lipnack & Stamps, 1997; Khaitan 1999). The cultural diversity along with communication barriers results into weakened team performance resulting in project's complexity (Dube & Pare, 2001). Daily & Steiner (1998) assert that as heterogeneous teams exhibit lower levels of integration and cohesion, the cultural diversity alone is sufficient to decrease team productivity.

14. **Language Barriers:** The virtual project teams consist of different members from across the world with different languages. These different languages results in communication problems as many things could go wrong if clear communication is not initiated. Vinaja (2003) suggested that the language problem can be somewhat difficult to overcome if a common language is not agreed upon. It is normally seen that individuals with the similar backgrounds tend to communicate with a common language and understanding, making it easier to establish workplace norms (Oakley, 1998). In the absence of this common language, it also becomes difficult to develop shared understandings and reduces the possibility of information sharing and collaboration

(Dougherty, 1987). The complexity of the work processes, confusion and ambiguity of communication gets increased with the language barriers resulting in reduced performance of the teams (Adler, 1997).

15. **Ability:** Ability is that group of skills, competencies, and characteristics that enable a team member to have influence on other team members (Mayer et al., 1995). It's this ability that makes an individual to be perceived as competent within some specific domain (Hung et al., 2004). Naha et al., (2012) found that the domain of the ability is specific because the team member may be highly competent in some technical area, affording that person trust on tasks related to that area. Therefore, the ability of a team member decides the level of trust which other team members have on him.

16. **Integrity:** A number of theorists proved integrity to be very important part of trust. Integrity is the degree to which the team member is believed to follow principles and guidelines that are accepted by the other team members (Mayer et al., 1995). The relationship between integrity and trust involves a person's perception that the other team member respects a set of principles which are believed to be accepted by the person. In addition, Mansor et al., (2012) suggested that in a virtual team collaboration context, the team leader's integrity and zero tolerance to violation of commonly set ethical principles are particularly important to motivate other team members to assume responsibility for their decisions and actions and act in a trustworthy way .

17. **Benevolence:** Benevolence is the extent to which team member feels interpersonal cares and concerns, and is willing to do good to others leaving aside their egocentric profit motive (Hung et al., 2004). This behaviour results in the well-being of the team as it results in the strong bonding among the team members. This cohesion becomes a strong foundation of trust (Mayer et al., 1995).

18. **Propensity to trust**: Mayer et al., (1995) defined propensity to trust as the ''general willingness to trust others''. Kuo & Thompson, (2014) proposed that because of

lack of past information about the individuals, team members have little or no basis for judging the new teammate's trustworthiness. Those members of the team who are having this ability or willingness to trust are expected to engage in trusting behaviors because they are especially inclined trusting team mates without knowing their trustworthiness and view new teammates as trustworthy based on limited information. This attribute of team members results in the healthy relationship among members thus assisting in trust building.

19. **Risk:** Perceived risk has been identified as an essential element of trust. It is defined as an assessment of the likelihood of significant and/or disappointing outcomes. The task interdependency, problem domain familiarity and organizational evaluation and control systems influence the individual's risk perception (Hung et. al., 2004). The building up of trust is affected by the individual's trusting behaviour as to whether a specific risk can be taken or not. Therefore, the trust building gets affected by the team member's trusting behaviour and external factors that make the decision significant and uncertain.

20. **Knowledge sharing:** The concept of virtual project teams brings people of different expertise under one umbrella, enabling the members to develop a pool of knowledge. Pinjani & Palvia, (2013) stated that individuals, who work within a virtual project team, can utilize others' knowledge as well as develop their own, necessary for the completion of jobs they are assigned to. The more effective their knowledge sharing, the better it they can perform their tasks. The context and the internal environment of the project teams influence team members' willingness to share knowledge with the other members (Kanawattanachai & Yoo, 2007). The knowledge sharing gets possible only when there is a trust and bonding among the team members.

21. **Cognitive elements**: Cognitive elements refer to the calculative and rational characteristics of trustees such as reliability (McAllister, 1995; Rempel et. al., 1985), integrity, and competence (Mayer et al., 1995). Gabarro (1978) found that a cognitive

aspect, especially competence, is key to establishing and sustaining trust in working relationships. In the context of virtual team environments, Meyerson et al (1996), suggested that people working in a temporary system dealt with each other primarily in terms of the professional roles each individual performs, not in terms of developing social relationships. Hence the ability, reliability, integrity and professionalism decide the development of trust within the virtual project teams.

22. **Affective elements:** Affect-based trust involves team members' concern for the well-being of the others. It involves the emotional aspects and care and concern others (McAllister, 1995; Rempel et al., 1985). These affective elements assist team members in making emotional investments in the trust relationships, express genuine care and concern for the welfare of partners, believe in the intrinsic virtue of such relationships, and believe that these sentiments are reciprocated (Pennings & Woiceshyn, 1987; Rempel et al., 1985). Ultimately, the emotional ties linking individuals can provide the basis for trust.

23. **Group Cohesiveness:** Team cohesiveness refers to the glue holding a group of people together so that they are motivated to remain in the team. It incorporates a sense a satisfaction, commitment to keep the group together and desire to work together in future (Amah et al., 2013a). This also contributes to the success of the organizations as it results in the information sharing among the team members. A moderate level of cohesiveness is required for teams to succeed and also contribute to an organization's competitive advantage. Shin (2005) argued that lack of physical interactions and informal relationships decrease the cohesiveness of virtual teams.

24. **Perceptions of the process**: P. Beranek, (2000) stated that perception of process include aspects such as trust, openness, and equality in participation . Positive perceptions of the interaction process have been associated with organizational gains while negative perceptions are associated with their losses (Steiner, 1972)

25. **Decision Quality:** Chi, Jen, Yang, & Fu, (2004) defined decision quality as feelings of team doing their task and decision efficient. It relates to the efficiency of the team. It is an outcome related measure and accounts for perceived freedom of participation. They also argued that a passionate leader can induce members to be highly committed to team activities. Paul et al. (2004) proposed that the multiple perspectives on issues related to the decision gets influenced by the collaborative conflict style that initiates higher levels of involvement of team members in group discussions. As a result, members may have the impression that the decision involved ample discussion and the integration of multiple views.

26. **Decision Quantity:** Decision Quality refers to the effectiveness of team. Chi, Jen, Yang, & Fu, (2004) defined decision quantity in the answers of the following two questions ―Does the virtual project teams make decision quick? What is the number of task finished in a certain period?

27. **Conflict:** Zimmermann (2011) defined conflict as an expressed struggle between at least two inter–dependent parties who perceive incompatible goals, scarce rewards, and interference from the other party in achieving their goals. It can be viewed as task, relationship and process conflict. Task conflict relates to perceived differences in views referring to tasks. Relationship conflict is concerned with interpersonal incompatibilities and is typically associated with interpersonal affect, such as tension. Process conflict refers to disagreements about the ways to complete a task. Relationship conflict has consistently been associated with process losses and decreased performance. It is observed that the frequency of occurrence of these kind of conflicts results in the reduction of trust among team members.

28. **Group Heterogeneity:** Heterogeneity refers to differing demographic characteristics, cultural norms of team members, diversity of functional roles and the tenure of virtual team members. Heterogeneity is likely to be high in a virtual team

because team members are more likely to represent different cultures, locations and functions (Furst et al., 1999).

29. **Leadership:** The virtual project team leaders play an important role in the team's success. They are the ones who take care of the alignment of rewards and establishing communication systems among the team members of the virtual project teams. They are considered as mentors who provide feedback and support to the teams. They are also responsible for clearly defining the roles of team members and appreciating the opinion and suggestions of the team members and ensure the accomplishment of tasks (Amah et al., 2013). Chutnik & Grzesik, (2009) stressed that the team leader should be assertive and yet not too bossy and maintains a consistent attitude over the life of the project.

30. **Organizational resources:** The availability of organizations resources – money, raw materials, equipment etc. which can be made available to teams affect the teams' performance. Amah et al.(2013) proposed that teams that have enough resources to work with will do better than those lacking necessary resources.

31. **Team reflexivity:** Team reflexivity is defined as "the extent to which team members overtly reflect upon the team's objectives, strategies and processes, and adapt them to current or anticipated circumstances" (West, 2000: p. 296). De Jong & Elfring, (2010) suggested that team reflexivity preforms double role, in that it involves both reflection upon previous accomplishments and adaptation to prepare for future actions. Schippers (2003), in one of her studies of ongoing teams, found team reflexivity partially accounted for the direct effect of intra-team trust on team performance

32. **Team Effort**: Team effort is defined as the extent to which team members devote their resources i.e., energy, attention and time to execute team tasks (Yeo & Neal, 2004). Zimmermann, (2011) refers team effort to team members actively working to make the team successful. Dirks (1999) first proposed that trust enhances the performance of the team when the team is exerting their maximum effort in fulfilling the tasks of the project.

The team effort is directly proportional to the motivation of the team members (Yeo & Neal, 2004) towards team goal accomplishment, even when one is experiencing setbacks or when others are taking it easy.

33. **Team monitoring:** Team monitoring is defined as the process of observing actions of teammates and watching for errors or performance discrepancies so that suggestions or corrective feedback can be provided to assist team members (Marks et al., 2001). Langfred (2004) found that the trust was negatively associated with monitoring, which subsequently led to declining team performance for short teams with high levels of individual autonomy. It involves real-time assessment after team's primary work is accomplished (Marks & Panzer, 2004).

34. **Time difference and holidays**: Vinaja (2003) demonstrated that the time difference has become a great concern as the distance between the virtual teams grows. Time becomes a hindrance for the execution of the projects when members belong to different time zones. This is primarily because the activities of the task for the project do not get synchronized. When working with different time zones, individuals can be a day behind of getting something done. Gustavo, Ferreira, Pinheiro, Lima, & Gouvea, (2012) proved that the when time zones are not overlapping between regions, it results in reduced level of communication between the teams.

35. **Team Evaluation**: The organizations are required to have their team evaluation procedures in place as these affects the motivation of the teams. Fang & Chiu (2010a) described team evaluation as procedures involved in the assessment concerning the appropriateness of performance outcomes. It can be broken down into four empirically separate dimensions: distributive justice (fairness of outcomes), procedural justice (fairness of decision-making procedures), interpersonal justice (fairness of interpersonal treatment), and informational justice (adequacy of information about decision-making procedures and outcome distribution). Distributive justice focuses on evaluations of the fairness of outcomes (Adams, 1965), while procedural justice emphasizes the fairness of

the process by which outcomes are settled (Lind & Tyler, 1988). Interpersonal justice reflects the degree to which individuals are treated by others with politeness, dignity, friendliness, and respect. Informational justice refers to the extent to which individuals are provided with information as to how decisions are made and how outcomes are distributed.

36. **Organizational Culture:** Organizational culture includes norms regarding the free flow of information, shared leadership, and cross-boundary collaboration. Organizations must provide the appropriate physical, financial and social support to the virtual project teams. These support systems should include evaluation and compensation systems, training development programme, information systems that provide relevant, accurate and timely information for the group. The organizational culture becomes the motivational factor for the virtual project teams to work together when they develop confidence in the internal operational issues

37. **Motivation:** Motivation is defined as the excitement level and the drive to work in a virtual team project. Amah et al., (2013) proposed that members must be motivated enough to work towards the achievement of the teams goals. Employees who like working and achieving in a group will do better as team members than those who like working and achieving alone. If the virtual team members feel challenged by the project work, the performance will show improvement (Lurey & Raisinghani, 2001). Warkentin et al., (1997) suggested that motivation is affected by the willingness of group members to contribute information that may contradict their own opinions or those of other group members. Motivation is also affected by the fairness of evaluation criteria set by the organizations and from the structured reward policies of the organizations.

38. **Task Interdependence**: Task interdependence refers to the degree to which work requires interaction among employees. The higher the task interdependence, the more effective the team. Task interdependence motivates team members to work together as they are able to see the impact of their contribution towards the team's success. It also

gives them a sense of responsibility among team members (Amah et al., 2013a). Several researchers have argued that the degree of task interdependence has a substantial effect on team processes and outcomes (Pinjani & Palvia, 2013). Interdependence of the task may also have an impact on team outcomes, including effectiveness and cohesion (Gully, Devine & Whitney, 1995; Gibson & Manuel, 2003; Gibson & Cohen, 2004). Three forms of interdependence are noted as being relevant for teams in general: goal interdependence, task interdependence and outcome interdependence (Wageman, 2001).

39. **Satisfaction of outcomes:** Warkentin et al., (1997) defined satisfaction of outcomes as positive attitudes of group members toward one another. Satisfaction has been defined as team members' affective well-being with respect to team member interactions or team performance (Stahl et al. 2009). Satisfaction is likely to lead team members to identify more strongly with the team (a stronger team identity), communicate more often, deal with conflicts better, and develop more positive interpersonal affect.

40. **Control variables** such as project length, age, gender, work experience, comfort with computers: In examining gender, Lind (1999) found that, compared to men, women in virtual teams perceived their teams as more inclusive and supportive, and were more satisfied. Gustavo et al., (2012) found that religion, holidays, customs cause some restriction in members of the team and makes difficult integration exercises among the members of virtual teams.

4.3 Construction of the Trust Indicator Table

The indicators affecting Trust in Virtual Teams, discussed in above section have been tabulated along with their references in the table 4.1 as shown below:

Table 4.1: Indicators affecting Trust in Virtual teams

S. No.	Indicators	Reference
1	Team Size	(Mansor et al., 2012), (Linda Peters & Karren, 2009), (Amah et al., 2013a),(Daspit et al., 2013), (Muethel et al., 2012), (Von der Ohe & Martins, 2010)
2	Respect	(Mansor et al., 2012), (Ashleigh & Nandhakumar, 2007)

3	Recruitment Strategy	(Mansor et al., 2012), (Lurey & Raisinghani, 2001), (Amah et al., 2013a), (Nader Ale Ebrahim et al., 2009),(Diallo & Thuillier, 2005)
4	Reward Plan	(Mansor et al., 2012), (Amah et al., 2013a), (Lurey & Raisinghani, 2001), (Nader Ale Ebrahim et al., 2009), (Furst et al., 1999), (Bryant et al., 2009), (Tran, 2012) (P. T. Nguyen, Babar, & Verner, 2006)(Kadefors, 2004)
5	Communication	(Mansor et al., 2012),(Chi et al., 2004),(Sridhar & Paul, 2006), (Hsin Hsin, Shuang-Shii, & Shu Han, 2011), (Gustavo et al., 2012), (Lurey & Raisinghani, 2001), (Amah et al., 2013a), (Shachaf, 2008), (Lin, Standing, & Liu, 2008), (Bryant, Albring, & Murthy, 2009), (Mansor et al., 2012), (Dorairaj et al., 2012a), (Xiao & Wei, 2008b), (Bergiel, Bergiel, & Balsmeirer, 2008), (Horwitz, Desmond, & Ulrik, 2006), (Kasper-Fuehrera & Ashkanasy, 2001), (Kimble, 2011b), (Muethel et al., 2012), (P. Nguyen, Babar, & Verner, 2006), (Olson & Olson, 2012), (Saxena & Burmann, 2014), (Verburg, Bosch-sijtsema, & Vartiainen, 2013), (Webster & Wong, 2008), (Zimmermann, 2011), (Tran, 2012), (Ashleigh & Nandhakumar, 2007b), (Bao, Yang, Xie, & Zhou, 2004), (Berry, 2011), (Bodensteiner & Stecklein, 2010), (Chutnik & Grzesik, 2009), (Dakrory & Abdou, 2009), (Germain, 2011; Hosøy, 2011),(Iacono & Weisband, 1997), (Kramer & Lewicki, 2010),(Lau & Rowlinson, 2009), (Maley & Moeller, 2014),(Mancini, 2010),(Nakayama, Binotto, & Pilla, 2006), (Pierce & Hansen, 2013), (Thomas & Bostrom, 2008),(Zhan & Xiong, 2008)
6	Employee Satisfaction	(Mansor et al., 2012), (Beranek, 2000), (Yang, 2014), (Chi et al., 2004), (Bryant et al., 2009), (Joe, Tsai, Lin, & Liu, 2014), (Vakola & Wilson, 2004), (Warkentin et al., 1997)
7	Network Security	(Mansor et al., 2012)
8	Training	(Mansor et al., 2012), (Beranek, 2000),(Furst et al., 1999),(Germain, 2011), (Lee-Kelley & Sankey, 2008), (Chi et al., 2004), (N Ale Ebrahim, Ahmed, & Taha, 2009), (Mansor et al., 2012), (Vakola & Wilson, 2004)

9	Clear Objectives(Goal Setting)	(Amah et al., 2013a; Bergiel et al., 2008; Brahm & Kunze, 2012; Christoph Clases, Renhard Bachmann and Wehner, 2004; N Ale Ebrahim et al., 2009; Germain, 2011; Gustavo et al., 2012; Hung et al., 2004; Lee-Kelley & Sankey, 2008; Mancini, 2010; Munkvold & Zigurs, 2007; Naha et al., 2012; Piccoli & Ives, 2014; Prasad & Akhilesh, 2002; Sumita Raghuram, Raghu Garud, Batia Wiesenfeld, 2001; R. M. Verburg et al., 2013)
10	Task Complexity	(Amah et al., 2013; Munkvold & Zigurs, 2007; Naha et al., 2012;Bell & Kozlowski, 2002; Xu, Le, Deitermann, & Montague, 2014)
11	Task-Technology Fit	(Bergiel et al., 2008; T. Daim, Ha, & Reutiman, 2012; Furst et al., 1999; Lurey & Raisinghani, 2001; Naha et al., 2012; Pinjani & Palvia, 2013; Qi, Wang, & Ma, 2010a; Xu et al., 2014)
12	Diversity	(Amah et al., 2013a; Bao et al., 2004; Garrison et al., 2010; Krebs, Hobman, & Bordia, 2006; Muethel et al., 2012; Naha et al., 2012; Linda Peters & Karren, 2009; Pinjani & Palvia, 2013; Saxena & Burmann, 2014b; Von der Ohe & Martins, 2010)
13	Cultural Barriers	(Amah et al., 2013a; Bao et al., 2004; Berry, 2011; Bodensteiner & Stecklein, 2010; Chutnik & Grzesik, 2009; T. Daim et al., 2012; Dorairaj et al., 2012a; Gustavo et al., 2012; Horwitz et al., 2006; Hsin Hsin et al., 2011; Lee-Kelley & Sankey, 2008; Maley & Moeller, 2014; Munkvold & Zigurs, 2007; P. Nguyen et al., 2006; Paul & He, 2012; Paul & Ray, 2009; Shachaf, 2008; Vinaja, 2003; Zhan & Xiong, 2008)
14	Language Barriers	(Gustavo et al., 2012; Maley & Moeller, 2014)
15	Ability	(Aubert & Kelsey, 2003; Bryant et al., 2009; Hung et al., 2004; Jarvenpaa et al., 1998; Kramer & Lewicki, 2010; Kuo & Thompson, 2014; Ellen Lau & Rowlinson, 2009a; Mansor et al., 2012; Mukherjee, Renn, Kedia, & Mukherjee, 2012; Naha et al., 2012; Riedl, Gallenkamp, & Picot, 2013; Rusman, Bruggen, Sloep, & Koper, 2010; Schiller, Mennecke, Nah, & Luse, 2014; Staples & Ratnasingham, 1998)

16	Integrity	(Aubert & Kelsey, 2003; Hung et al., 2004; Jarvenpaa et al., 1998; Kramer & Lewicki, 2010; Kuo & Thompson, 2014; Ellen Lau & Rowlinson, 2009a; Mansor et al., 2012; Mukherjee et al., 2012; Naha et al., 2012; Riedl et al., 2013; Schiller et al., 2014)
17	Benevolence	(Aubert & Kelsey, 2003; Hung et al., 2004; Jarvenpaa et al., 1998; Kramer & Lewicki, 2010; Kuo & Thompson, 2014; Ellen Lau & Rowlinson, 2009a; Mukherjee et al., 2012; Riedl et al., 2013; Rusman et al., 2010; Schiller et al., 2014)
18	Propensity to trust	(Aubert & Kelsey, 2003; Jarvenpaa et al., 1998; Kuo & Thompson, 2014; Lee et al., 2014)
19	Risk	(Christoph Clases, Renhard Bachmann and Wehner, 2004; Hung et al., 2004; Mansor et al., 2012; Naha et al., 2012; Robertson, Gockel, & Brauner, 2013)
20	Knowledge Sharing	(Bodensteiner & Stecklein, 2010; Christoph Clases, Renhard Bachmann and Wehner, 2004; Dirks, 1999; Dorairaj et al., 2012a; Pangil & Chan, 2014; Pinjani & Palvia, 2013; Vakola & Wilson, 2004; Yang, 2014)
21	Cognitive (e.g., competence, reliability, professionalism)	(Ashleigh & Nandhakumar, 2007; Kanawattanachai & Yoo, 2002; Melisa Beach , Sue Coates , Carol Hinton, 2014; Pangil & Chan, 2014; Pierce & Hansen, 2013; Staples & Ratnasingham, 1998; Webster & Wong, 2008; Xiao & Wei, 2008b; Zimmermann, 2011)
22	Affective elements (e.g., caring, emotional connection to each other)	(Dirks, 1999; Joe et al., 2014; Kanawattanachai & Yoo, 2002; Kuo & Thompson, 2014; Lurey & Raisinghani, 2001; Melisa Beach , Sue Coates , Carol Hinton, 2014; Pangil & Chan, 2014; Sridhar & Paul, 2006; Staples & Ratnasingham, 1998; Webster & Wong, 2008; Xiao & Wei, 2008b; Yang, 2014; Zimmermann, 2011)
23	Group Cohesiveness,	(Amah et al., 2013a; Ashleigh & Nandhakumar, 2007; Bao et al., 2004; P. M. Beranek, 2000; Berry, 2011; Brahm & Kunze, 2012; Bryant et al., 2009; Christoph Clases, Renhard Bachmann and Wehner, 2004; Dakrory & Abdou, 2009; Daspit et al., 2013; Diallo & Thuillier, 2005; Dirks, 1999; Dorairaj et al., 2012a; Garrison et al., 2010; Horwitz et al., 2006; Lankton, McKnight, & Thatcher, 2014; Lin et al., 2008; Paul et al.,

		2004; Sridhar & Paul, 2006; Sumita Raghuram, Raghu Garud, Batia Wiesenfeld, 2001; Warkentin et al., 1997; Williams & Brown, 2010)
24	Perceptions of the Process	(P. M. Beranek, 2000; Lurey & Raisinghani, 2001; Warkentin et al., 1997)
25	Decision quality	(Chi et al., 2004; Lurey & Raisinghani, 2001; Paul et al., 2004)
26	Decision Quantity	(Chi et al., 2004; Paul et al., 2004)
27	Conflict Management Style.	(Brown, 2000; Hosøy, 2011; Panteli & Sockalingam, 2005; Paul et al., 2004; Vinaja, 2003; Zimmermann, 2011)
28	Group Heterogeneity	(Furst et al., 1999; Paul et al., 2004; Vinaja, 2003)
29	Project length, percentage done, age, gender, Work Experience, Comfort with computers	(Bryant et al., 2009; Daspit et al., 2013; Muethel et al., 2012; Munkvold & Zigurs, 2007; Linda Peters & Karren, 2009; Sumita Raghuram, Raghu Garud, Batia Wiesenfeld, 2001; Von der Ohe & Martins, 2010)
30	Leadership	(Amah et al., 2013a; Bao et al., 2004; Bell & Kozlowski, 2002; Bergiel et al., 2008; Chi et al., 2004; Chutnik & Grzesik, 2009; T. U. Daim et al., 2012; Dakrory & Abdou, 2009; Daspit et al., 2013; Horwitz et al., 2006; Lankton et al., 2014; Lurey & Raisinghani, 2001; Piccoli & Ives, 2014; Pierce & Hansen, 2013; Xiao & Wei, 2008a)
31	Organizational Resources	(Amah et al., 2013a)
32	Team Reflexivity	(De Jong & Elfring, 2010; Delgado-Márquez, Hurtado- Torres, & Aragon- Correa, 2012; Jo, Lee, Lee, & Hahn, 2014; Kadefors, 2004; Vinaja, 2003)
33	Team Effort	(De Jong & Elfring, 2010)
34	Team Monitoring	(De Jong & Elfring, 2010)
35	Time difference and holidays	(Lee-Kelley & Sankey, 2008; Munkvold & Zigurs, 2007; Vinaja, 2003)
36	Team Evaluation(Justice)	(Fang & Chiu, 2010b; Furst et al., 1999)
37	Corporate culture (control, norms and fairness, contracts and agreements)	(Brown, 2000; Diallo & Thuillier, 2005; Dorairaj, Noble, & Malik, 2012b; Furst et al., 1999; Kadefors, 2004; Kasper-Fuehrera & Ashkanasy, 2001; Kimble, 2011; Ellen Lau & Rowlinson, 2009b; Lin et al., 2008; Rusman et al., 2010; Tran,

		2012; R. Verburg & Vartiainen, 2013; Wong et al., 2008)
38	Motivation	(Brown, 2000; Qi, Wang, & Ma, 2010b)
39	Task Interdependence	(Olson & Olson, 2012; Saxena & Burmann, 2014b)
40	Satisfaction of outcomes	(P. M. Beranek, 2000; Staples & Ratnasingham, 1998)

4.4 Grouping of Indicators for trust in Virtual Project Teams

The Literature review on virtual project teams and on models of trust and performance helped in identifying the indicators (variables) needed to construct the primary data collection questionnaire instrument. As mentioned earlier, secondary data analysis of 149 research papers was instrumental in identifying 40 indicators. After understanding the definition of these indicators in section 4.2 and finding the communalities among them through their definitions, these indicators were grouped in 12 categories as shown in table 4.2.

Table 4.2: Grouping of Indicators of Trust in Virtual Teams

S. No.	**Categories**	**Indicators**
1.	Team Cohesiveness	Respect + Employee Satisfaction + Affective elements (e.g., caring, emotional connection to each other) +Team Effort
2.	Team's reflection on processes	Satisfaction of Outcomes +Perceptions of the Process +Team Reflexivity+ Risk
3.	Technology	Communication (Type + Tool) + Network Security + Training(self-managing skills + technology training+ Project Management skills) +Time difference and holidays
4.	Corporate Culture	Clear Objectives(Goal Setting)+Recruitment Strategy+ Organization Resources+ Reward Plan + Team Evaluation
5.	Task-Technology Fit	Task Complexity + Task Interdependence + Relationship of task and technology
6.	Diversity	Functional Diversity + Problem Solving Approach + Cultural Barriers +Language Barriers
7.	Team member Characteristics	Ability + Integrity + Benevolence +Cognitive elements(e.g., competence, reliability, professionalism)
8.	Knowledge Sharing	Knowledge Sharing among Team Members
9.	Decision Effectiveness	Decision Effectiveness (Quality + Quantity)
10.	Conflict	Conflict among team members
11.	Control Variables	Team Size + Project length and Percentage of work done, Age and Gender , Work Experience
12.	Leadership skills of Team Manager	Motivation + Team Monitoring + Propensity to trust

These 12 categories are further reduced to 8 classification names as shown in figure 4.1 by providing the following understandings:

- Team's reflection on process (S. No. 2 in table 4.2) consists of satisfaction of outcomes, perception of process, team reflexivity and risk. This is similar to team evaluation in Corporate culture (S.No.4) and hence team's reflection on process can be merged with team evaluation.
- Knowledge sharing (S. No. 8 in table 4.2) deals with information sharing among the team members of virtual project teams. The information sharing is more when the tasks are interdependent on each other. Therefore, it was merged with task interdependence of Task- Technology fit (S. No. 5) as knowledge sharing is directly proportional to the task interdependence.
- Decision Effectiveness (S. No. 9 in table 4.2) deals with the effectiveness of team members and based on the feedback of decisions on team members' actions, mentoring is provided to the members of the virtual project teams. Hence, decision effectiveness is merged with team mentoring (S. No. 12)
- The control variables (S. No.11 in table 4.2) are not taken in the generation of figure 4.1 for reduction of 12 categories to 8 classification names.

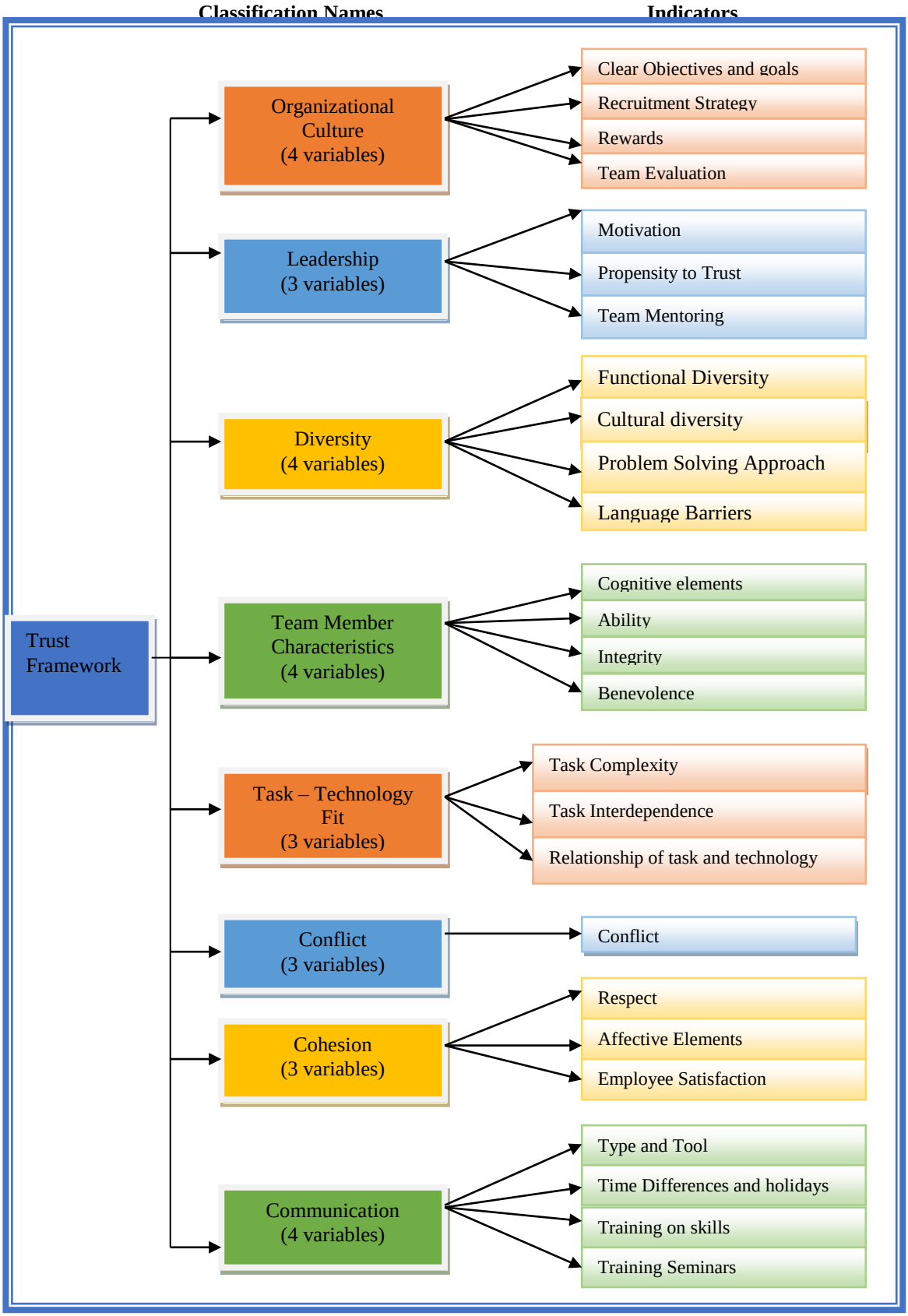


Figure 4.1: Grouping of indicators to classification names

4.5 Research Hypothesis and Theoretical model of Trust

Trust is a multidimensional construct with both cognitive and affective elements and due to this, it is difficult to understand or cultivate (McAllister, 1995). Given the inherently complex nature of virtual project teams in construction sector of Middle East, the researcher proposes that trust in virtual project teams, as a dependent variable, will increase with the development of positive organizational culture, leadership skills of superior, team member characteristics, task- technology fit. Through exhaustive literature review, it has been observed that trust is also affected by diversity of team members and communication among team members. There are two mediators- conflict and cohesion and one moderator- experience which affect various relationships in different ways.

From the understanding of literature and the factors responsible for the trust, the researcher proposes the following theoretical research model of trust as shown in figure 4.2. A careful review of the model led the researcher to identify one prime moderator: experience in virtual project teams.

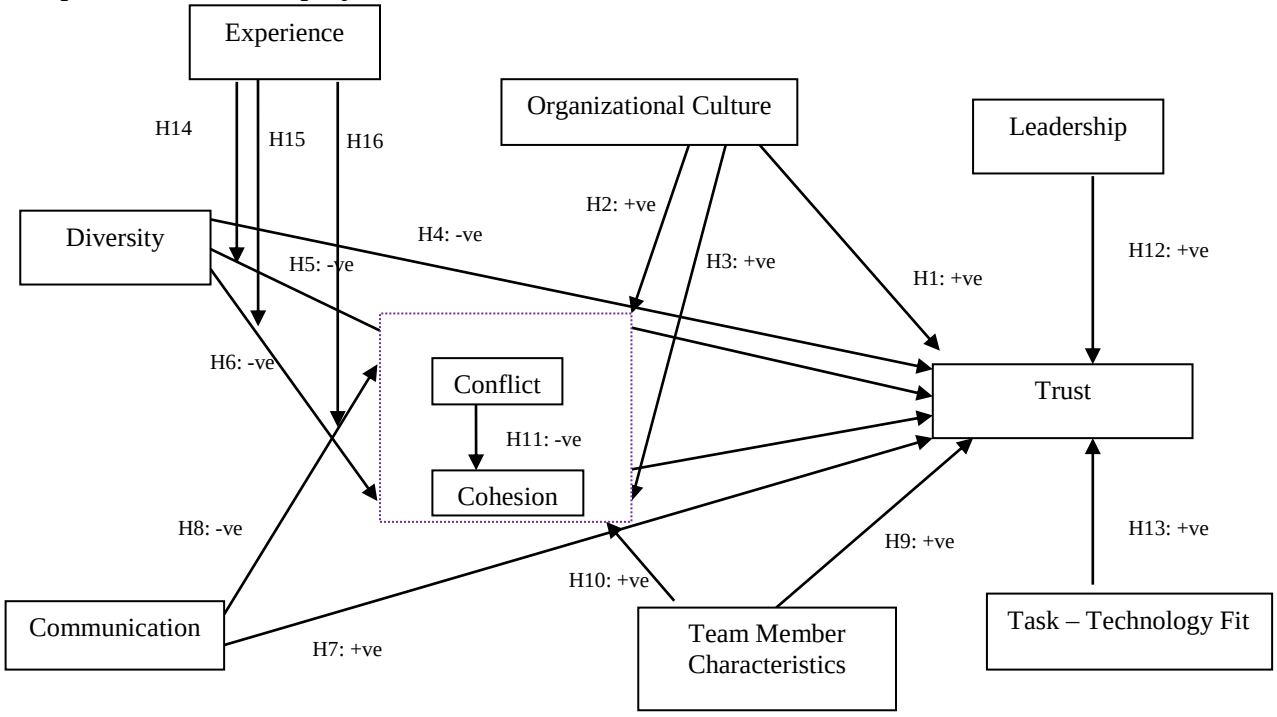


Figure 4.2: Proposed Theoretical Model of Trust

4.5.1: The effect of Organizational Culture on Trust among virtual project team members.

The organizational culture consists of clear objectives and goals for the team members, recruitment strategy of the company, its reward structure and the process of team evaluation.

The success of any virtual project team depends on the clearity of objectives and definition of involved processes for the successful accomplishment of the organizational goals (Lipnack & Stamps, 1997; Norton & Smith, 1997). Doney et al. (1998) believed that team members are at high level of personal risk when they donot know what they have to deliver and when they need do affecting the building of trust with the organization. Gazor (2012) proposed that when members are committed to the team objectives, especially long-term goals that bring about successes of whole of team, they are persuaded to pursue team's ideals spontaneously. Therefore to ensure trust among team members, it is very important to have clear understanding of team goals during the team planning process (Brahm & Kunze, 2012). Furst et al. (1999) stated that the potential uncertainity regarding performance expectations can be reduced by clear and agreed upon goals and objectives. Such goals may also challenge team members, giving them a hightened sense of urgency relative to accomplishing team based objectives. These goals and objectives should help to build a collective team identity, fostering the co-operative behaviours necessary for trust buliding in teams.

Team selection is a key factor which differentiates successful teams from unsuccessful ones. Amah, Nwuche, & Chukuigwe (2013) believed that members of teams are first members of organizations before they become members of teams. The selection criteria an organization uses, therefore affects the type of people that will be in teams. Bell & Kozlowski (2002) proposed that virtual teams can be designed to include the people most suited for a particular project. If that does not happen, there is high risk of distrust among the team members as they do not trust on their teammates' capability.

Barkhi et al. (2004) examined rewarding teammembers based on individual decision outcomes or on team decision outcomes. They found that rewards greatly increase the trust of team members in the organization. Chidambaram & Tung (2005, p. 151) state, "When members' contributions to the group cannot be identified readily, they respond by identifying less with and contributing less to, the group.". Bryant et al. (2009) suggested that incentive structure with both an individual and supervisory component may be most effective for improving attitudes of virtual team members.

Team evaluation refers to mechanism of fairness of outcomes, fairness of decision making procedures, fairness of interpersonal treatment and adequacy of information about decision making procedures and outcome distribution (Bryant et al., 2009). A fair procedure of team evaluation greatly increase the trust among the team members as they became confident that there is no biasing as far as the evaluation is concerned.

Cohesion is stated as the bonding between the team members. It is believed that when the team is closely knitted together, they increases the probability of achieving organizational goals. This leads to increased trust within the teams. Furher, the conflict based on the task distribution and process execution leads to alternative solutions to the problem. This increase the achievement of organizational goals in most efficient way.

Therefore, the researcher proposes the following hypotheses:

H1: A positive relationship exists between organizational culture and trust in virtual project teams.

H2:Conflict mediates the positive effect of organizational culture on trust.

H3: Cohesion increases the positive effect of organizational culture on trust.

4.5.2: The effect of Diversity on Trust among virtual project team members.

The diversity of team involve functional and cultural diversity, language barriers and problem solving approach of team members.

L. Peters & Karren (2009) stated that diversity among team members can cause variations in their attitudes, values, and overall performance, giving rise to conflicts among the team members. As the virtual project teams involve people from different cultures and backgrounds, conflict is more likely to emerge in heterogeneous than in homogeneous teams (Jehn, 1995; Jehn, Northcraft, & Neale, 1999). Shachaf, (2008) found that cultural diversity sets higher challenges for leaders and members as the language barriers increases the complexity, conflict, confusion, and ambiguity of communication. The functional diversity of the teams provides different perceptions to the problem in hand but again it all depends upon the individuals how they take this diversity. It may lead to affecting trust negatively if the members understand these as hindrance to their own profits. Therefore cultural, functional and language differences results in miscommunication, which effects trust, cohesion, and team identity negatively.

In terms of antecedents, previous studies related the emergence of trust and conflict to team diversity. It has been argued that there is a higher probability for a team member to trust similar others than dissimilar ones. Therefore, trust is more likely to emerge in homogeneous rather than in heterogeneous teams (Costa, 2003). (Curşeu & Schruijer, 2010) proposed that in line with the similarity-attraction hypothesis, team diversity has a positive impact on conflict and a negative impact on the emergence of trust. Team diversity increases the conflict within the teams and effects the trust negatively. It is also been found that the team members perceive team members more trustworthy that belong to same culture than the ones who belong to other cultures (Zolin *et al.*, 2004).

A cohesive group is one in which the members are attracted to the group and to its task (Kozlowski & Bell, 2003). In the distributed team literature, cohesion has been linked to team effectiveness (Gonzalez et al., 2003), team satisfaction, and effective communication (Chidambaram, 1996). Although diversity is intended to yield a variety of perspectives and solutions, these perspectives are unlikely to emerge if team members are reluctant to interact with individuals who are different (Jackson, 1992). Research tends to support this claim across various types of diversity including cultural, work-unit

and demographic diversity. Studies suggest that culturally diverse teams are less cohesive than culturally homogeneous teams (Thomas, Ravlin, & Wallace 1994; Knouse & Dansby 1999), and thus less likely to interact at a level that produces superior outcomes. Tsui, Egan, & O'Reilly (1992), report an inverse relationship between work-unit diversity and psychological attachment among group members. Hence, diversity is likely to inhibit the interaction that is necessary for team members to be fully committed to the team and each other.

Therefore, the researcher proposes the following hypotheses:

H4: A negative relationship exists between the diversity of team members and trust in virtual project teams.

H5: Conflict mediates the negative effect of diversity on trust in virtual project teams.

H6: Cohesion mediates the negative effect of diversity on trust in virtual project teams.

4.5.3: The effect of Communication on Trust among virtual project team members.

The development of trust is linked to increased communication among members (Jarvenpaa, Shaw & Staples, 2004). The communication aspect of team members consists of communication tool and type used by the team members. It also deals with variation in time difference and holidays for the geographically dispersed teams and requirement of training by the team members of the virtual project teams. Amah et al., (2013) suggested that managers can send employee for training to acquire skills and experiences that will make them good team players. The training could allow employees to experience the satisfaction that teamwork can provide. The training could be in the form of workshop to help employees improve their problem solving, communication, negotiation, conflict management, and coaching skills.

Anderson *et al*. (2007) suggested that the effective use of communication, especially during the early stages of the team's development, plays an equally important role in

gaining and maintaining trust. The global nature of virtual teams makes communication among them an ongoing challenge in virtual teams (McDonough, Kahn & Barczak, 2001). This results in the reduction in mutual understanding within the team. The overall understanding is hampered when a shared language is lacking among members, and communication becomes more strained when some members are co-located while others are geographically distributed (Crampton, 2001). Jarvenpaa & Leidner (1999) proved that virtual teams that send more social communication achieve higher trust and better social and emotional relationships (Robey et al., 2000). Rolf Trautsch, (2003) also stated that it is difficult to trust team members where there is little to no relationship can be difficult.

The distributed teams exhibit weaker relational links among team members as compared to face- to-face teams (Warkentin et al., 1997). Researchers attribute the weaker relationships to the significant reliance on communication tools and technologies and the difficulties of communicating with team members across time and space (Powell et al., 2004). The cohesion among the team members gets affected with the high reliance on technology to communicate (Warkentin et al., 1997). However, it is also felt when the teams are designed for bigger and longer duration projects, greater cohesiveness may be achieved over time as more social cues are exchanged among team members (Chidambaram, 1996). Research also indicates that as teams become more efficacious with the communication technologies, higher levels of trust tend to develop among members (Jarvenpaa et al., 1998).

There is also a misconception among dispersed team members as they often assume that co-located team members are talking and sharing information that is not communicated to them. These private exchanges among co-located team members have been identified as the cause of friction between team members (Crampton, 2001; Sarker & Sahay, 2002) which results in conflicts among virtual team members. A. Kankanhalli, B. Tan, K.-K. Wei. (2000) stated that the characteristics of communication technology, especially in a virtual team, may contribute to team conflict. Thus, the very nature of the electronic exchanges within virtual teams may be a source of conflict; when the level of information

richness is low because of a lean medium of communication. The end result may be confusion, differing interpretations, and ultimately conflicting points of view. (Saxena & Burmann, 2014a) confirmed that "richer" means of communication such as face-to- face interaction are more effective in task and conflict resolution, as compared to 'leaner' means of communication as in virtual teams where merely exchange of written words or only vocal exchange of information is possible.

Therefore, the researcher is proposing following hypotheses:

H7: A positive relationship exists between communication of team members and trust in virtual project teams.

H8: Conflict mediates the positive effect of communication on trust in virtual project teams.

4.5.4: The effect of Team Member characteristics on Trust among virtual project team members.

In some relationships, trust is only dependent on simple basic variables but as relationships mature and members get to know each other, individuals learn to trust or distrust the team members according to their characteristics (Kramer & Lewicki, 2010). The team member characteristics involves ability, integrity, benevolence and cognitive elements of team members. Jarvenpaa et al., (1998) used dyadic trust attributes for both the trustor and trustee. Trustee attributes are defined as their perceived benevolence, integrity and ability. Benevolence is the willingness of a party to benefit another. Ability is the belief in the trustee's ability or skills to fulfill its obligations as expected by the trustor. Integrity is a party's expectation that another consistently relies on socially accepted principles of behavior(Mayer et al., 1995).

Greenberg et al. (2007) showed that trust is composed of three components: ability, integrity and benevolence. These components play important roles in different stages of establishment and operation of a virtual teams. Jarvenpaa et al. (1998) also emphasized that trust depends on members' ability, benevolence and integrity.

Mukherjee et al., (2012) found that the trustee's value adding capability(ability) will be evaluated by the trustor as virtual teams are formed to react quickly and flexibly to market opportunities. The virtual teams operate in an environment full of uncertainty and turbulence. Thus, the trustor has to believe that the trustee has good intentions or motives(benevolence) regarding the relationship even in the absence of any legally binding formal agreement or previous commitment. As the team members of virtual teams are not bound by formal contracts, benevolence is viewed as an integral part of "organizational trustworthiness". Kasper-Fuehrer & Ashkanasy (2001) stressed the importance of "business ethics"(integrity) in a virtual setting, while communicating trustworthiness. Kanawattanachai & Yoo (2002) showed that trust relies more on cognitive components such as competence, reliability, professionalism than affective ones which includes care and emotional connection to each other. Nakayama et al. (2006) also stressed that trust is related to competence, loyalty and receptiveness. Mukherjee et al. (2012) stated that members of virtual project team will take their decision to trust, cognitively, after judging the overall ability, benevolence and the integrity of the trustee members of the team. If the bonding between the team members is strong, then characteristics of team members greatly enhance its effect on trust.

The more competent the members in a team, the higher the level of team trust. Similarly, the higher the levels of benevolence and integrity of team members, the higher the level of team trust. Therefore the researcher proposes the following hypotheses:

H9: A positive relationship exists between characteristics of team member on trust in virtual project teams.

H10: Cohesion increases the positive effect of team member characteristics on trust.

4.5.5: The effect of Conflict on Cohesion of the team in virtual projects.

In the virtual teams, the members are physically separated from one another and the scope of their social interaction is also limited. Dafoulas & Macaulay (2012) have stated

that a high level of trust is required in order for virtual teams to perform effectively and avoid any delays and conflicts, which is much higher than in traditional collocated teams.

Conflict is broadly defined as perceived incompatibilities or perceptions by the parties involved that they hold different views or have interpersonal incompatibilities. In a team, the members contribute to the team through social and task inputs. Thus conflict in any team is concerned with relationship issues and with task issues (Jehn, 1997). Relationship conflicts deals with difference in personal taste, political preference, values and ideology, whereas task conflicts are conflicts about the distribution of resources, about procedures and policies, and about judgments and interpretation of facts (De Dreu & Weingart, 2003).

Relationship conflict exists when there are interpersonal incompatibilities among group members. This includes tension, animosity, and annoyance among group members (Jehn, 1995) and leads to decrease in cohesion of the team. The relationship conflict is based on emotional or interpersonal issues and is very detrimental to the functioning of a team. In highly interdependent groups, relationship conflict is expected to have a stronger negative effect on the emergence of trust. Moreover, Amason et al. (1996) found that relationship conflict diminished decision creativity and quality, eroded team unity and commitment, and curtailed decision acceptance and support. Accordingly, relationship conflict can promote divide, diminish trust and weaken relationships. This in turn curtails open communication, value-adding knowledge sharing, learning and ultimately knowledge creation. The conflicts needs to be managed very carefully as it leads to damage relationships, limit cognitive functioning and learning and also accentuate the negative influences of diminished trust or mistrust.

Therefore the researcher proposes the following hypothesis:

> ***H11: The more conflict among virtual team members, the less is the cohestion among them.***

4.5.6: The effect of Leadership skills of superior on Trust among virtual project team members.

The leadership of superior includes components like motivation skills, propensity to trust others and having a role of mentor.

In a virtual work setting, the opportunity for face-to-face contact is limited as employees are working in different locations than their managers. This means that the manager has significantly fewer opportunities to view employee behavior than would exist in a conventional work setting (i.e., where the manager and employee work in the same building). Under these circumstances, trust can be used to coordinate with virtual team members because observing behaviors is no longer a feasible coordination and control mechanism in a virtual workplace (Lipnack & Stamps 1997).

Motivation of team members is often a challenge in virtual teams as they lack face-to-face interaction with their superiors In the virtual worksplace, there remains nobody to pat on their back when they achieve targets nor is there anybody who supports them in time of difficulty. This results in the frustrations of virtual team workers and greatly effects the perforance of the teams (Lipnack & Stamps, 1997; Lee-Kelley, et al. 2004). Therefore, it becomes more important for team leaders to motivate team members in these "high-intensity conditions" to "commit strongly to the overall team effort" (Kerber & Buono, 2004; Horowitz et al., 2007; Malhotra et al., 2007).

Chutnik & Grzesik, (2009) emphasised that the leader should create an atmosphere of team learning especially during the process of team building . It is believed that teams which are learning continuously can produce extraordinary results as a group and this also brings personal growth to the iniviuals. Mentoring is an aspect of this. The virtual team leaders can monitor the progress of the team just online. Virtual team leaders need to deeply examine synchronous and asynchronous communication patterns to determine who participates in team activities and who needs support or suggestion for further participation (Kirkman, Rosen, & Gibson, 2002). This will help them to evaluate the

team members as per their performance. The team members rely on their managers to keep them informed of necessary information and to support their activities with effective feedback and recognition.

Therefore, the researcher proposes the following hypothesis

H12: A positive relationship exists between leadership skills of the manager and trust in virtual project teams.

4.5.7: The effect of Task – Technology fit on Trust among virtual project team members.

Since virtual team members are distributed across space, communication technologies provide the means to link members together and are absolutely important. The choice of the communication technology is dictated by the nature of tasks the team is performing as well as depend on the organization's resources (Bell & Kozlowski, 2002). Less complex tasks often require minimal communication and collaboration between team members. In these situations, asynchronous communication media, such as e-mail or screensharing, will usually be sufficient because the need for reciprocal communication and interdependence is minimal . However, if a task is very complex and requires a great deal of information exchange and group decision-making, e-mail will not provide an effective means of communication between team members and a process loss will result.

Amah et al., (2013) defined task interdependence as the degree to which work requires interaction among employees. The higher the task interdependence, the more effective the team. Task interdependence motivates team members to work together as they are able to see the impact of their contribution towards the team's success. It also gives them a sense of responsibility among team members. De Jong et al. (2007) proposed that a central characteristic of trust development is the degree of task interdependence. Task interdependence describes how much one individual group member's performance is dependent upon the skills and action their group members (Campion et al., 1993; Wageman & Baker, 1997). The resulting interaction and the exchange of information has

been linked positively with virtual team trust (Dirks & Ferrin, 2001). High task interdependency results in increased needs for adjustment, communication, and coordination (Guzzo & Shea, 1992). This creates an environment that facilitates trust development (Wilson et al., 2006). Lower trust has been linked with low task interdependence (Langfred, 2007).

Olson & Olson, (2012) adds some to the trust literature by examining the impact of task complexity, task interdependency, and communication media on short term virtual teams, its primary contribution is the sequence of conditions on trust. Thus, it is extremely important in this context to ensure a fit between the task, the technology and the structure of the work which a virtual team is supposed to carry out. Only if virtual team members are "able to adapt the technology and match it to the communication requirements of the task at hand" (Maznevski & Chudoba, 2001, p. 483), it is likely to be effective (Powell et al., 2004).

Therefore the researcher proposes the following hypothesis:

H13: A positive relationship exists between task- technology fit on trust in virtual project teams.

4.5.8: Moderation effect of experience in virtual projects on Diversity and Communication.

Experience would be used as moderator variable. The experience in virtual project teams does not only refers to the number of years in the virtual project teams but it also relates to the number of projects done by individuals. It is important, because the longer the team has been in existence, the longer its members have interacted and had time to develop harmonious relationships. This results in reducing the conflict even though team members are from diverse sections of society. Moreover, increase in experience in virtual teams makes individual more mature and it helps in building cohesion. Since senior members normally have many domain experiences and were often assigned with the responsibilities pertaining to teamwork (Hwang, 2012; McMillan & Ledder, 2001; Reilly

et al.; Vaccaro et al., 2012), they are more likely to provide accurate, reliable and objective data. Experience team members are able to carry out interdependent tasks that lead to the completion of an entire piece of work(Amah et al., 2013b). As the virtual project teams are made up of heterogeneous team members, these kind of teams experience more conflicts and take longer time to develop although they are more effective at solving complex problems requiring innovative solutions. The competences are also developed through experience (Chutnik & Grzesik, 2009). Therefore, to get the best set of skills it is recommended to lead or work in as many virtual teams as possible, and to work on a number of cross-cultural teams. This leads to greater cohesion even though the teams are diverse in nature. Continues improvement procedures in terms of degree of communication provide a baseline for maximizing the benefits from experienced team members on one project to another one (Azimi, 2011). Also shared experiences and goals are the fastest ways to build establishing a relationship of mutual understanding or trust within a team

Therefore the researcher proposes the following hypotheses:

H14: Experience in virtual project team will moderate the relationship between diversity and conflict in virtual project teams in that the relationship is weaker for individuals with high levels of experience.

H15: Experience in virtual project team will moderate the relationship between diversity and cohesion in virtual project teams in that the relationship is stronger for individuals with high levels of experience.

H16: Experience in virtual project team will moderate the relationship between communication and conflict in virtual project teams in that the relationship is weaker for individuals with high levels of experience.

The summary of Proposed Research Hypotheses is mentioned in table 4.3.

Table 4.3: Summary of Hypothesis

Hypothesis Number	Statement of Hypothesis	Exogenous Variable (Latent construct)	Endogenous Variable (Latent Construct)	Mediating Variable	Moderating Variable
H1	*A positive relationship exists between organizational culture and trust in virtual project teams.*	Organizational Culture	Trust	-	-
H2	*Conflict mediates the positive effect of organizational culture on trust.*	Organizational Culture	Trust	Conflict	-
H3	*Cohesion increases the positive effect of organizational culture on trust.*	Organizational Culture	Trust	Cohesion	-
H4	*A negative relationship exists between diversity of team members and trust in virtual project teams.*	Diversity	Trust	-	-
H5	*Conflict mediates the negative effect of diversity on trust in virtual project teams.*	Diversity	Trust	Conflict	-
H6	*Cohesion mediates the negative effect of diversity on trust in virtual project teams.*	Diversity	Trust	Cohesion	-
H7	*A positive relationship exists between communication of team members and trust in virtual project teams.*	Communication	Trust	-	-
H8	*Conflict mediates the positive effect of communication on trust in -virtual project teams.*	Communication	Trust	Conflict	-
H9	*A positive relationship exists between characteristics of team member on trust in virtual project teams.*	Characteristics of team member	Trust	-	-

H10	*Cohesion increases the positive effect of team member characteristics on trust.*	Characteristics of team member	Trust	Cohesion	
H11	*The more conflict among virtual team members, the less is the cohestion among them.*	Conflict	Cohesion	-	-
H12	*A positive relationship exists between leadership skills of the manager and trust in virtual project teams.*	Leadership skills of the manager	Trust	-	-
H13	*A positive relationship exists between task-technology fit on trust in virtual project teams.*	Task- Technology fit	Trust	-	-
H14	*Experience in virtual project team will moderate the relationship between diversity and conflict in virtual project teams in that the relationship is weaker for individuals with high levels of experience.*	Diversity	Conflict	-	Experience
H15	*Experience in virtual project team will moderate the relationship between diversity and cohesion in virtual project teams in that the relationship is stronger for individuals with high levels of experience.*	Diversity	Cohesion	-	Experience
H16	*Experience in virtual project team will moderate the relationship between communication and conflict in virtual project teams in that the relationship is weaker for individuals with high levels of experience.*	Communication	Conflict	-	Experience

4.6 Summary

This chapter dealt with the indicators affecting trust, which had been found through extensive literature review. Thereafter, the construction of Trust indicator table was done along with their references. After understanding the definitions of these indicators and finding commonalities among them, they were grouped together to have more concise listing of the indicators. Based on the literature review findings, the research hypotheses were created and theoretical model of trust was proposed.

The next chapter would be focusing on the research methodology and philosophies undertaken for this doctoral research work. Various data collection methods that were used in the chronological research phases would be explained in this chapter.

Chapter 5

Research Methodology

5.1 Introduction

This chapter focuses on the Research Methodology followed in this doctoral research. It explains the different options that were available and the ones which were actually chosen to achieve the stated aim and objectives of the present study. It explores the different types of research philosophies and illuminates the ones which were used in this research. The research methods undertaken for data collection and analysis are also described in detail. In summary, this chapter outlines how the study was conducted, and discusses how the research philosophy, approach, research techniques, tools and research strategies were chosen.

5.2 Concept of Research Methodology

A Research is defined as the investigation that aims to uncover interesting or new facts (Walliman, 2011). **Research Methodology** is a way to solve a research problem by using informed decisions who guides the researcher at every step about the process of research (C. R. Kothari, 2004). Saunders et al (2009) presented the overall research methodology in the form of an "onion", as shown in figure 5.1, in which the thoughts with regard to the research problem lie in the centre and in order to reach this central position, several layers have to be "peeled away". These layers defined in this research onion are research philosophy, approach, strategy, choice, time horizon, and techniques.

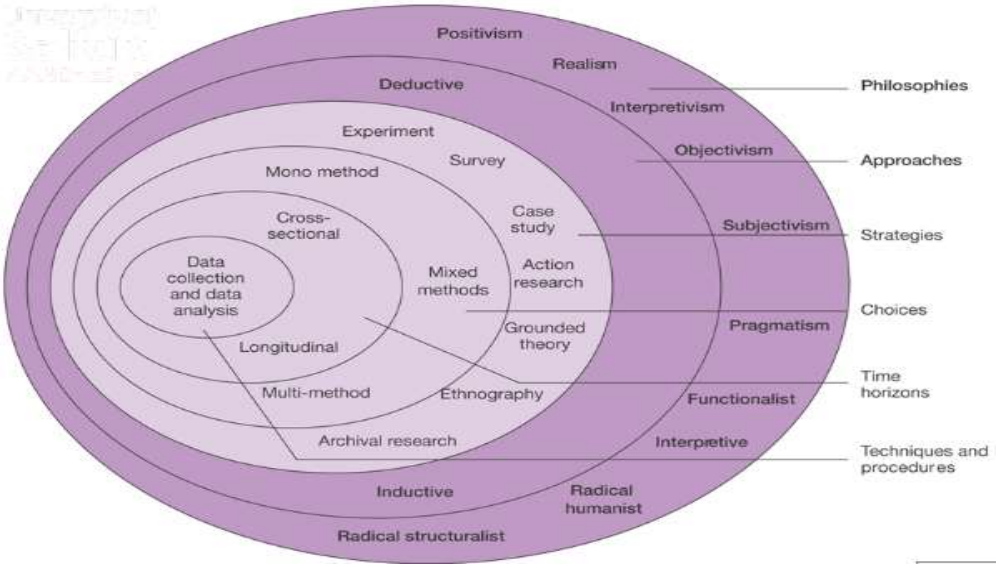


Figure 5.1: The Research Onion (Saunders et al (2009))

The selection of an appropriate methodology is very important to achieve research aim and objectives. The methodology framework of this study is shown in Figure 5.2 and is described in the coming sections.

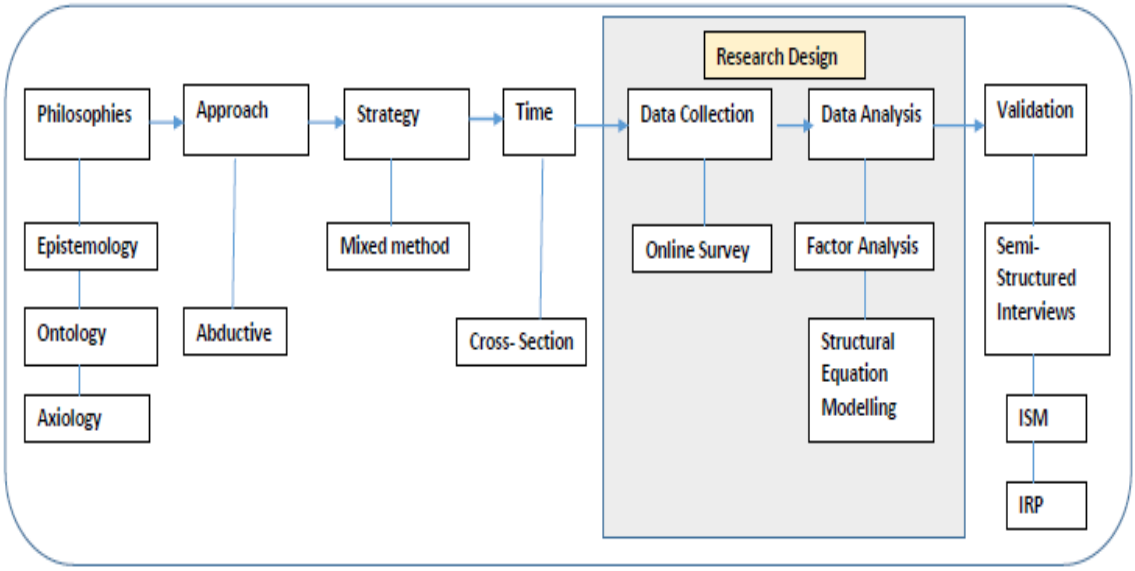


Figure 5.2: The Research Framework

5.3 Research Philosophy

Research philosophy relates to the development and nature of knowledge containing important assumptions about how the world is viewed from different standpoints. Easterby-Smith, Thorpe & Jackson (2008), noted three main reasons for understanding research philosophy.

- Firstly, it provides the clarity in the research design.
- Secondly, it helps the researcher for making decisions about the appropriateness of a particular design.
- Thirdly, it also assists the researcher to identify and even create new design methodology that may be outside the researcher's past experience.

There are three major ways of thinking about research philosophy: **Epistemology, Ontology and Axiology** as shown in table 5.1.

Table 5.1: Assumptions of Research Philosophy (Sexton, 2003)

Epistemology (The how?)	General set of assumptions about how we acquire and accept knowledge about the world
Ontology (The what?)	Assumptions that we make about the nature of reality
Axiology (The why?)	Assumptions about the nature of values and the foundation of value judgments

5.3.1 Epistemology

Epistemology is an understanding of assumptions about how we acquire and accept knowledge about the world. Epistemology defines:

- What is knowledge?
- How is knowledge acquired?
- How can the knowledge be justified or reasonable?

It can be represented in a continuum where the extremes are **Positivism** and **Interpritivism** (**social constructionism)** (Saunders et. al. 2007).

Positivism refers to the construction of highly structured and measurable laws, often called as 'scientific method', which are needed to propose and test theories with data (Sexton, 2003). Here the research is not influenced by the values of the researcher and usually involves large samples of quantitative data and statistical hypothesis testing (Saunders et. al., 2007).

Interpretivism refers to the explanation of human action by understanding the way in which world is understood by the individuals (Sexton, 2003). Here the research is conducted with people by adopting assertive stance to understand their point of views. It usually involves small samples by collecting qualitative data through in-depth interviews (Saunders et. al., 2007).

This research intends to explore and investigate the drivers and barriers of Trust development in virtual project teams in Construction companies of Middle East and create a model based on the findings. Many of the factors are based on psychological or

behavioural attributes of the team members of virtual teams and some of the factors are based on technical aspects of the collaborative tools used in the virtual teams. In this context, it could be said that the research takes a stance that needs to look into both the philosophies of *Positivism* and *Interpretivism* with a bit more propensity towards *Interpretivism.* This can be shown in figure 5.3.

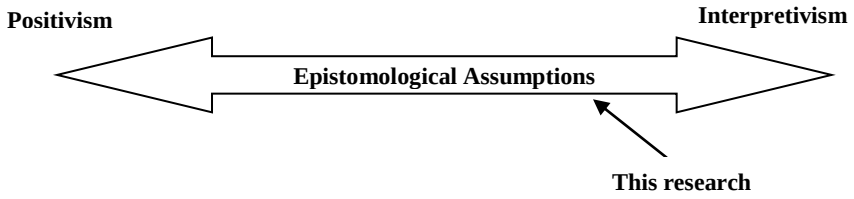


Figure 5.3: Philosophy of Research – Epistemology stance

5.3.2 Ontology

Ontology is the study about what kinds of things exists- what entities are there in the universe (Saunders et al, 2007). This consists of two main aspects – ***Objectivism (Realism)*** **and** ***Subjectivism (Idealism)***. ***Objectivism*** relates itself to the facts which exist wholly independent of the mind. It represents a truth which is always true independent of human feelings. On the other hand, ***Subjectivism*** refers to the facts that are true only at certain time or place or for certain people (Saunders et. al, 2007).

This research study aims to understand the reality through virtual project team members and expert's perceptions - thus dealing with Objective data. But at the same time, the study also tries to identify key factors that act as drivers and barriers of Virtual team trust formation in context with the Middle East - thus dealing with Subjective data. Hence, it can be stated that this research study takes an Ontological stance midway in the continuum between the Ontological limits of *Objectivism* and *Subjectivism.* This can be shown in figure 5.4.

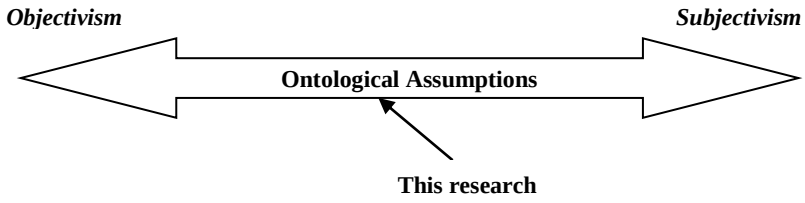


Figure 5.4: Philosophy of Research – Ontological stance

5.3.3 Axiology

Axiology relates itself to the values that the researcher attaches to the existing knowledge. Heron (1996) argues that the researcher often makes use of his values as a foundation for making decisions on the way they conduct their research. It can be represented in a continuum where the extremes are **"Value-neutral"** and **"Value-biased". Value-neutral Research** is value free and objective. **Value-biased Research** is value laden and subjective (Sexton, 2003).

This research will heighten the researcher awareness of value judgements that the researcher is going to make in drawing conclusions from the data. These value judgements may lead to the drawing of conclusions which may be different from those drawn by researchers with other values. These judgements would be made based on literature study and analysis of data collected. Therefore, the researcher places herself "Value- neutral" as shown in figure 5.5.

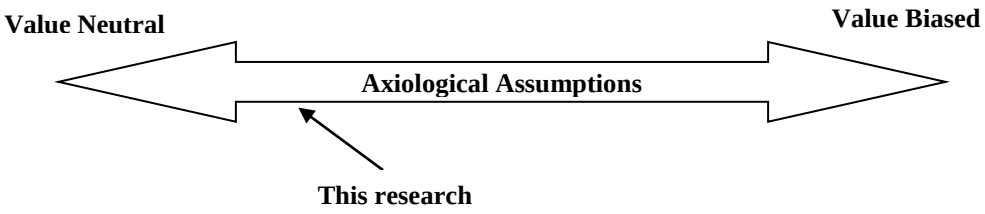


Figure 5.5: Philosophy of Research – Axiology stance

5.4 Research Approach

Research approach begins with an enquiry about a theory that organizes and summarizes knowledge by proposing some relations between the events. The investigation could be deductive or inductive (Creswell, 2003). Deductive approach starts from general and goes to specific context for confirmation while inductive approach is from specific to general (Denzin & Lincoln, 2009). However, there could be a combination of both inductive and deductive logic applied in the research at different stages which has been described as abductive logic (Saunders, et al., 2012).

The approach used in this process employed abductive logic which is a combination of *Deductive* as well as In*ductive* processes. The initial part of the research followed a deductive pattern – factors were identified after Literature Review, Conceptual model was created using Literature review, the survey instrument was tested by Pilot Study and the model was refined by analysing data collected from questionnaire. The remaining part of the research was Inductive – the refined model was applied to existing virtual project teams and analysis was done to validate the model.

5.5 Research Strategy

Research strategy defines the methods, techniques, procedures or instruments through which the information is collected and analysed (Crotty 1998). There are seven types of research strategies that one may employ. These are **Experiment, Survey, Case Study, Action Research, Grounded Theory, Ethnography and Archival Research** (Saunders et. al., 2007). As there is no single strategy that is superior, it is possible to employ a combination of different strategies (Saunders et al., 2012). The presence of existing knowledge, the nature of research aim and objectives and the amount of time and resources decides the choice of strategy (Saunders et. al., 2007).

The purpose of this research is Exploratory in nature as there have been a limited number of studies done so far to identify the factors affecting trust in virtual project teams in Construction sector in the context of Middle East and this research seeks to find new insights by creating a model of trust building in virtual project teams. This research work would follow both – *Quantitative* as well as *Qualitative* process of research. In addition, the data collected using a survey strategy will be used to suggest possible reasons for particular relationships between variables and to produce model of these relationships. There are many research choices available as shown in figure 5.6 (Saunders et. al., 2007):

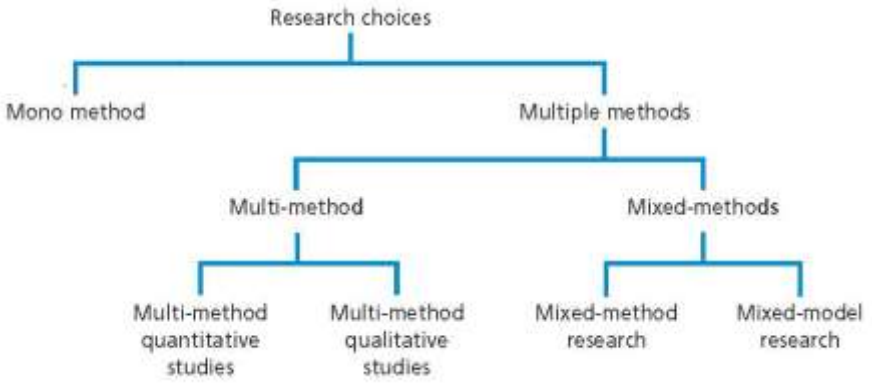


Figure 5.6: Research Choices

The researcher is going to adopt mixed-method research**.** It uses quantitative and qualitative data collection techniques and analyse procedures either at the same time (parallel) or one after the other (sequential) but does not combine them. Here, in this case quantitative data are analysed quantitatively and qualitative data are analysed qualitatively.

5.6 Time Horizon

The time horizon to research design is independent of research strategy which the researcher is pursuing and the choice of method. This research adopted Cross-sectional study considering the limited resource of time.

5.7 Research Phases

The activities in this research have been divided into three inter-dependent phases. These phases are – **Research Planning, Research Development and Research Validation** with each phase having Input- Process- Output step.

1. The **Research Planning** activities include problem description and literature review. In the process of Problem description, the input is preliminary literature review that helped to give the output of Aim, Objectives and Research Questions. In the Literature review process, the analysis of various research papers and articles was done to understand the nature and kinds of virtual project teams. The literature review helped to understand the various models of trust and performance for other sectors though not in

context of the Middle East. This understanding provided the list of variables affecting trust in virtual teams. After getting list of variables through a comprehensive literature review, the variables were grouped together through by understanding their definitions. This also led to the construction of hypotheses.

2. The **Research Development** activities consists of Pilot Study and Analysis, Design of Data collection methods, Sampling, Survey for Factor Analysis and creation of model of trust using structural equation modelling using AMOS. The Pilot study interview instrument was developed on the basis of variables found after literature review and discussion. This survey instrument was used to elicit information from a sample set of virtual team professionals and practitioners. This information was analysed qualitatively and was further used for refining questionnaire and interview instrument. The respondents for the questionnaire survey were graduates working in virtual project team either as team members or project managers of various construction companies in Middle East. The mailing lists of virtual team project communities were obtained from the online directories of Construction companies as mentioned in the Ethical form. The respondents who responded became self-sampled population. The questionnaire survey was web based and a link of online questionnaire was sent to the participants. This data was fed in the SPSS for factor analysis that helped the researcher to finalise the factors responsible for building of trust in virtual project teams. Then, the structural equation modelling was used to create the final structural model resulted after hypothesis testing.

3. The model of trust generated from structural equation modelling was used in the **Research Validation phase**. This is the final phase of the research whose objective is to validate the research findings. This was done through semi- structured interviews conducted for four project managers and six team members. The analysis of these interviews gave insights on the themes constructed from structural equation modelling. In order to provide guidelines to the project managers and senior management about the factors responsible for building of trust in virtual project teams in construction sector, the Interpretive Structural Modelling(ISM) and Interpretive Ranking process (IRP) is used.

The ISM technique was used to examine the relationship among various factors of trust and resulted in ISM- based model of Trust. In addition, IRP technique was applied to rank the factors of trust with respect to the key benefits of trust development in virtual project teams. It helped researcher to propose guidelines for project managers of construction industry for building trust in the virtual project teams. This also helped the researcher

4. to draw conclusions and recommendations. Successful completion of the activities of this phase signifies the completion of the research process. This was followed by a thesis write-up phase. The Pictorial depiction of the Research Phases is shown in figure 5.7.

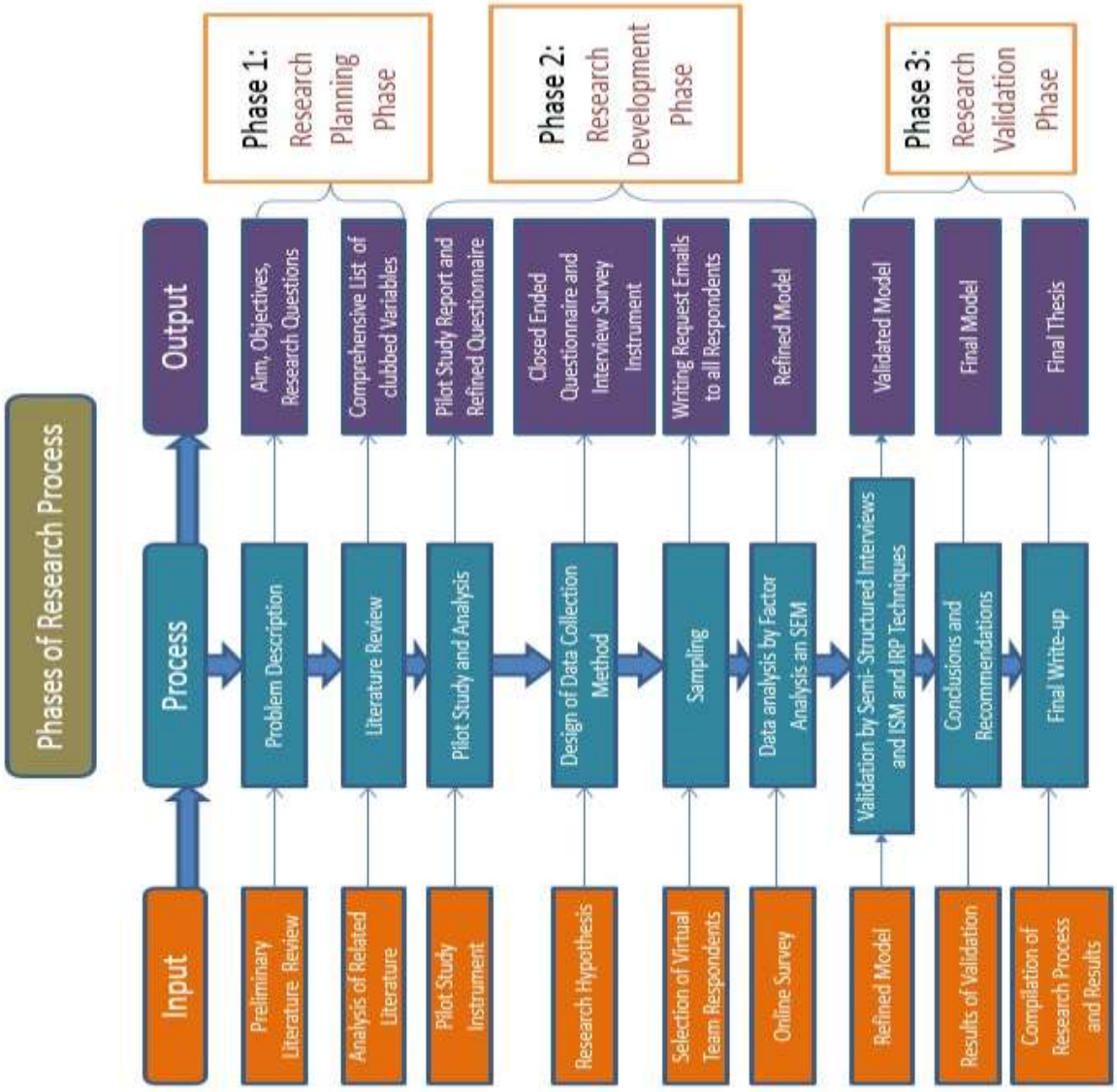


Figure 5.7: The Research Process

5.8 Research Activities

This section would explain the details of the primary research activities that are likely to be carried out during each of the Research Phases.

5.8.1 Research Planning Phase – There would be two primary research activities in the Research Planning Phase i.e. **Problem Description** and **Literature Review.**

5.8.1.1 Problem Description

The Problem description was needed to understand the concept in greater detail. The preliminary literature review involved exploring the terms of definition of Virtual Teams, kinds of virtual teams, performance of Virtual teams, challenges of virtual teams and role of trust in performance of virtual teams. The preliminary literature review provided with the clear description of Aim, Objectives and Research Questions**.**

5.8.1.2 Literature Review

Literature review helped the researcher to develop and expand research topic. It prevents the researcher from duplicating previous results (Hair et. al., 2011). Literature Review and Synthesis was needed continuously to gain an understanding of the research topic. Literature Review had been very instrumental in order to explore the fields such as virtual project teams, challenges of Virtual project Teams, perspective of Virtual teams in Construction sector which were very crucial for the researcher to position her research on the academic map of knowledge creation (Ridley, 2008). The Literature review helped to identify the variables needed to construct the Primary Data Collection Questionnaire Instrument. This investigation was divided into two parts, the first part is understanding the concepts of virtual project teams and second part dealt with the various models of trusts and performance though not much in the Middle East context because of scarcity of research done in this topic. This helped in extracting the indicators challenging the trust of virtual teams, which were further grouped together by understanding their definitions and relevance in literature. The list of such indicators is described in detail in chapter 4 of

this report. This also helped in the construction of hypotheses involving their relationship with trust. Research review summary reports were created and documented.

5.8.2 Research Development Phase – The research development phase consisted of the Pilot Study and Analysis, Design of Data collection methods, Sampling and Survey for Factor Analysis and creation of model of trust using structural equation modelling using AMOS.

5.8.2.1 Pilot Study

A Pilot study helps the researcher to test the research objectives and questions by doing rehearsal of the main study (Yin, 2004). It enables the researcher to make necessary changes or amendments before the primary data collection is conducted. This helps to pre-test the questionnaire in terms of their accuracy and consistency by using a small sample of respondents (Hair et. al., 2011). The respondents were asked probing questions about each part of the questionnaire, from instructions to scaling to format to wording, to ensure that each question is relevant, clearly worded and unambiguous (Hair et. al., 2011).

In this research, the Pilot study was carried out with seven participants from construction sector. Their work experience ranged from Projects - Construction and Engineering, Automobile Industry and Manufacturing Industry, bids and proposals to Consultancy. These professionals had worked in the construction industry as project managers, architects, engineers and had worked in Oman, Dubai, Muscat, Sharjah, UK, US, Holland, Qatar and Saudi Arabia. The Pilot Study was conducted using a combination of the Pilot Questionnaire and Semi-structured interview method though telephonic, web chat or in-person. Prior appointments with the selected participants were formally obtained well ahead of the actual interviews. The data collected through expert and semi-structured interviews was analyzed. Semi-structured interviews enabled the researcher to extract quality information through descriptive responses. Such quality information would not have been possible to collect by the use of only a closed ended Questionnaire.

The details of the analysis of pilot study have been discussed in Chapter 6: Data Collection, Analysis and Research Results. The outcome of the Pilot Study was an expert validated Questionnaire Survey Instrument for main data collection.

5.8.2.2 Design of Data Collection Methods

The data in the research can be either qualitative or quantitative. The methods used to elicit this data can be observations, questionnaire, interview, protocol analysis, focus groups and content analysis of documents (Collis & Hussey, 2009: Dawson, 2009). Collis & Hussey (2003) suggested that qualitative method of data collection is a time consuming process but it enables in-depth information to be gathered on the study. They involve data obtained through direct observations and interviews (Saunders et al., 2012; Creswell et al., 2011; Collis & Hussey, 2003). The quantitative data collection methods stresses on objective measurements and numerical analysis by using statistical means. The questionnaire (Saunders et al, 2009) is the most commonly adopted method of collecting data in researches involving social sciences. However, the choice of a data collection method may depend upon the purpose of the study, the resources available and skills of the researcher. In this research context, the interview and questionnaire method was adopted as methods of data collection.

- **Interviews :** Interviews involves a purposeful conversations between two or more persons in which one referred to as the interviewer asking clear and concise questions while the other(s) referred to as the interviewee(s) listens attentively and willing responds to the questions asked (Saunders at al., 2012). Interviews are time consuming, expensive and can involve limited size of participants (Sekaran, 2006; Saunders et al., 2009). Interviews have been classified as structured, semi-structured or unstructured. They can be conducted on a face to face, via telephone or internet (Denscombe, 2010). Subsequently, semi structured interviews have been described as the most common employed in social and management research as it allows in-depth investigations across a number of specific topics by using probing questions during the interview process (Saunders et al, 2009; 2012).

- **Questionnaires:** Questionnaires are data collection methods in which the respondents are asked to respond to same set of questions in a predefined order that will be interpreted in a same context by all the respondents (Saunders et al., 2012). A questionnaire could be either closed, open-ended or a combination depending on the type of data required and may be administered through self, telephone, post or web- based (Collis & Hussey, 2009). The benefit of questionnaires is that they can be employed to reach a large volume of respondents in many locations in comparatively lesser time than interviews (Denscombe, 2010). This method offers greater anonymity as well (Sekaran, 2006). However, this data collection method has the disadvantages of low response rates and lack of detailed responses (Saunders et al., 2009).

The researcher conducted a comprehensive literature review of 149 studies on virtual project teams. Table 5.2 shows the techniques that were used for data collection in each study, by the research method used. As might be expected, questionnaires were the most common data collection technique, followed by interviews and Case Studies / Observations. It is important to note that many studies used more than one technique, i.e., a combination of quantitative (e.g., questionnaires) and qualitative (e.g., Interviews) data collection. The organizational field studies relied on questionnaires the most, followed by interviews.

Table 5.2: Number of Studies Using Each Data Collection Technique by Type of Study

	Number of Studies That Used the Technique			
Data Collection Technique	**Educational Field Study**	**Organizational Field Study**	**Experiment**	**Total**
Questionnaires	20	42	8	70
Interviews	7	21	-	28
Case Study/ Observations	4	13	7	24
Text Analysis- Email	2	1	-	3

Understanding through literature and focussing on the objective of the research, the researcher used Mixed-Methods involving both quantitative and qualitative analysis. The Quantitative research included questionnaire survey which was designed by using the software Survey Monkey and was administered online. The Qualitative research provided valuable insights on behavioural aspects of team members of virtual teams.

Methods for Questionnaire/ Interview Survey

The semi structured interviews was employed in pilot study to allow in-depth exploration to identify the drivers and barriers of trust development in virtual project team members of construction sector in Middle East. Probes were used when needed to explore the concept further. The final version of the questionnaire was based on revisions from previous pilot study. The questionnaire was tested using a pilot study. The questionnaire questions were designed with the aim of capturing views of the respondents on the identified variables.

A web- based survey was being used to gather views from the respondents. There is evidence that having a web survey or even an email option can boost response rates to postal questionnaires (Yun & Trumbo, 2000). Responses of respondents who complete Web Survey Questionnaires are automatically sent via the Internet to a data server and stored on it (Birnbaum, 2004). The online surveys eliminate the need of coding and tabulating the responses as they can be directly exported to the spreadsheets when the survey is taken. This largely eliminates clerical errors (Philbrick et. al., 2010).

For this research, a web survey (Appendix VIII) was created using Online Survey providers Survey Monkey. The Survey Monkey Privacy Policy says that the information of respondents (including email addresses and survey results), whether public or private, will not be sold, exchanged, transferred, or given to any other company for any reason whatsoever, without the consent. Hence this Web- Survey service was selected to launch the web questionnaire for data collection.

Likert scales are used to measure the magnitude of opinion, not simply its direction (McBurney, 2007). A 5-point Likert scale was employed to enable the respondents to rank the importance of each factor from a minimum of "strongly disagree" to a maximum of "strongly agree". In this questionnaire, the *open ended question* design was only dedicated to get information on respondent's profile and their work description.

The questionnaire was divided into three main sections. Section 1 was on demographic information of respondents along with their experience on virtual projects, Section 2 seeks information about the organizational culture and leadership skills of the superior and Section 3 deals with information about the dynamics and communication of Virtual Project Team dealing with the internal working of the team along with the characteristics of team members.

The concept of trust is captured in the refined questionnaire in Appendix IX as section 4. All the items of trust were being taken from literature as mentioned in Questionnaire Reference table in Appendix X. Also the cover letter mentioning the aim of the research was sent to the respondents before taking semi- structured interviews as mentioned in Appendix V. In addition to this, in online questionnaire, the invitation to participate in the research clearly mentioning the concept of trust along with ethics of the research was mentioned in Appendix VIII.

The participants of this research needs to be of some substantial qualification to understand the research. The researcher wanted data from only those who understand the concept of trust. The concept of trust, a social science subject, cannot be understood by any layman of construction industry. Therefore at the start of filling online questionnaire, the respondents are asked if they are having qualifications as certificate, diploma, bachelor's or Master's degree. And the respondent cannot move forward without answering this question as it is being made compulsory question to be answered. Hence this research involved Judgemental sampling which is a non- probability sampling technique as this research requires data to be filled by specific kind of respondents.

The outcome of this activity was responses of participants in an excel sheet which was used for statistical calculations.

5.8.2.3 Sampling

Sampling is needed as data needs to be collected from respondents to find answers for the research questions. It involves a sampling procedure to be adopted. This procedure involves determining the location, participants sample size and recruitment procedures for the participants (Creswell, 2014; Saunders et al., 2012). Saunders et al. (2012) pointed out that sampling is needed because it is not possible to survey or interview the entire population as it would be a very time consuming and costly procedure.

Sampling procedures are of two types – Probability Sampling procedures and Non-probability Procedures. In the probability sampling procedure, the respondents are selected through a process that gives equal chances of selection to all the individuals in the sample population. It includes random, systematic, cluster and multi-stage and the stratified sampling techniques (Denscombe, 2010). On the other hand, the Non-probability procedures do not use any statistical theory but operate on pure chance. It is applied where smaller sample population is required. Quota, purposive, theoretical, snowball and purposeful, convenience samplings are some of the various techniques employed (Denscombe, 2010: Saunders et al., 2009).

This research however used Judgemental Sampling which is a Non- probability based sampling techniques. Judgemental sampling design is usually used when a limited number of individuals possess the trait of interest. It is the only viable sampling technique in obtaining information from a very specific group of people. In this research, the respondents are expected to be graduates working in construction sector of the Middle East, therefore this sampling technique were used.

In this research, web based questionnaire instrument was posted on the groups of Construction Network and LinkedIn Construction groups. These posting were done only

after taking formal approvals from the Web master and Community leaders of these communities. Hence, in case of such web surveys, the respondents were self – selected. The respondents who answer the questionnaire formed a self-sampled population. They are graduates in their respective fields in order to understand the research study. Also, the mailing lists of some chosen virtual team project communities were obtained from the online directories of Construction companies such as www.gulfconstructionworldwide.com and www.constructionweekonline.com. The database of University Placement cell was also used to get links of various construction firms. The Emirates Oil and Gas directory, Middle East Building and Construction Directory, The Blue Book Building were also referred to get the email ids of team members and project managers of the construction projects. The target respondents for the questionnaires from the organisations identified required to be a part of this study were relevant construction professionals such as Quantity surveyors, Architects, Engineers, Builders and construction managers/Builder who are working or have worked in various virtual project teams of construction sector and were believed to provide valuable information needed for this research study. These respondents were sent a link of online questionnaire instrument. Their responses were automatically recorded in the software tool being used for making online questionnaire.

In this research, sensitive areas involving inviting and gaining organisational, participants and respondent informed consent, agreement, data protection and anonymity followed due ethical approval procedure before proceeding for data collection (Appendix XI).

5.8.2 4 Data Analysis Methods to be used

Data Analysis for this research consisted of tabulating and testing of data gathered using a set of qualitative and quantitative methods. Statistical Analysis software such as IBM SPSS and AMOSv22 were used to aid the analytic process in this research. Quantitative data statistical analysis have been categorised into descriptive and inferential statistics (Field, 2013; Pallant, 2013; Dawson, 2009). In analysing the data collected via questionnaire, both descriptive and inferential statistics were conducted. Following

statistical methods were used for the analysis of the data collected from the above mentioned online surveys, such as:-

i. Descriptive statistics provided by frequencies, measures of central tendency and dispersion were used to describe the main features of the collected data in quantitative and thus give an overall sense of data being analysed. The common types used are frequency, percentages, mean, median standard deviation (Field, 2013; Pallant, 2013; Dawson, 2009). In the context of this research the questions in section 1 of the questionnaire (Appendix VIII), are mainly associated with categorical data and thus descriptive statistics using frequency and percentages will be most appropriate to analyse, describe and present the data findings. On the other hand, inferential statistics seeks to explore group comparisons looking for patterns and relationships in the data. Thus in the context of the research, questions in section 2 and 3 of questionnaire (Appendix VIII) were presented in Likert scale to identify respondents ratings on the level of their agreement on certain issues. It is expected that the data analysis requires the non-parametric tests for their analysis (Elaine & Seaman, 2007).

ii. Reliability Analysis was used to determine the consistency and stability of any measure. Reliability Analysis was used to determine the reliability of the data collected from Questionnaire survey. Reliability analysis was determined by the Cronbach's Alpha test which is a measure of internal consistency and it checks how closely related a set of items are as a group (Santos, 1999).

iii. Factor Analysis was used to describe the variability among the factors initially identified through literature review and refined after Pilot Study. This enabled in the reduction of the number of factors and the formation of factor groups.

iv. Structured Equation Modelling (SEM) was used to analyse the structural relationship between measured factors and the latent constructs. Structural equation modelling (SEM) is a statistical methodology that takes a confirmatory (i.e., hypothesis-testing) approach to the analysis of a structural theory, one that stipulates causal relations among multiple variables (Bentler, 1988). The goal is to determine whether a hypothesized theoretical model is consistent with the data collected to reflect this theory. The consistency is evaluated through *model-data fit*, which indicates the extent to which

the postulated network of relations among variables is plausible. SEM requires large sample size (usually $N > 200$; e.g., Kline, 2005, pp. 111, 178). SEM involves the evaluation of two models: a *measurement* model and a structural / path model. The software tool which was used for SEM is IBM AMOS Ver. 22.

5.8.3 Research Validation Phase –This final phase is a validation phase which is required to validate the model of trust developed through structural equation modelling. It consists of semi-structured interviews and Interpretive Structural Modelling and Interpretive Ranking Process.

5.8.3.1 Semi- Structured Interviews

The structured equation modelling through its statistical tests provided the model of trust. This model presented nine themes which were verified with the semi-structured interviews of professionals working in the construction sector of the Middle East. For this research, invitation letter to participate in this research was sent to project managers and team members of various construction companies. The respondents who responded became sample for the validation process. The analysis of these interviews, as mentioned in Chapter 7, provided the logic and reasoning behind the results got from SEM model of trust particularly in the context of the Middle East. It resulted in the validation of the factors found responsible for trust in virtual project teams which exist in various construction companies.

5.8.3.2 ISM and IRP Techniques

Interpretive Structural Modelling was first proposed by J. Warfield in 1973 and is used to provide fundamental understanding of complex situations, as well as to put together a course of action for solving a problem (Anantatmula & Kanungo, 2005; Warfield, 1974). ISM is a well-established methodology for identifying and summarizing the relationships among specific elements which define a problem or an issue (Sage, 1977; Warfield, 2005). ISM is utilized to understand the relationships between the challenges of trust building and to develop insights into a collective understanding of these relationships. It

showed the hierarchical relationship between the various factors of trust. This was very important as it provided guidelines to the project managers and senior management about the relative importance of each factor of trust and to understand how each factor influences the other. The detailed description of ISM techniques is discussed in chapter 8.

The IRP method presents clearly the interpretive logic of the decision as the expert is supposed to spell out the interpretive logic for dominance of one element over the other for each pair-wise comparison. This logic is usually documented on the knowledge base for future use by decision makers. It ranked the various factors of trust with respect to the key benefits of the trust. This technique provided the guidelines to the project managers about the importance of each factor of trust in realizing the benefits of trust. It also assists them to know which factors are superior to other in achieving the key benefits.

5.9 Summary

This chapter has tried to give an overview of the methodological process adopted for this research by discussing the research philosophical stance, the approach as well as the strategy and research methods to be employed. It further discussed how the research design adopted was able to fulfil the criteria measuring quality of the research design. This chapter focused on the three phases of research- Research Planning, Research Development and Research Validation. It gave detailed description of techniques use in those research activities.

The next chapter would be focusing on the data analysis of the data collected through various data collection methods used in various research phases explained in this chapter. Analysis of data would be explained in detail with reference to the statistical methods that have been listed in this chapter.

Chapter 6
Data Collection, Analysis and Research Results

6.1 Introduction

This chapter aims to describe in detail the collection and analysis of data collected during this doctoral research. It explains the implementation of the numerous research methods and philosophies outlined and briefed in Chapter 5. Data was collected using both qualitative and quantitative methods. Proper care was taken in enforcing appropriate and judicial ethical principles during the various data collection activities. Secondary data collected and analyzed through desk studies and literature review was used to create the data collection survey instruments. Such instruments were refined through Pilot Studies involving Construction industry professionals. Primary data was collected using the validated questionnaire survey instrument and tabulated appropriately for further analysis. Statistical methods explained in Chapter 5 were used to treat the data using the statistical software – Statistical Package for the Social Sciences (SPSS). Descriptive statistics was used to describe the main features of the collected data in quantitative and thus give an overall sense of data being analyzed. Reliability Analysis was used to determine the reliability of the data collected from Questionnaire survey. Factor Analysis was used to describe the variability among the indicators initially identified through Literature Review and refined after Pilot Study and tested using questionnaire survey, thus enabling in the reduction of the number of factors which resulted in the formation of seven factor groups. Structural equation modelling (SEM), a statistical methodology, was used for hypothesis testing of the theoretical model which has been created by the understanding of literature review. The hypothesized model was then tested statistically in a simultaneous analysis of the entire system of variables to determine the extent to which it is consistent with the data. If goodness-of-fit is adequate, the model argues for the plausibility of postulated relations among variables; if it is inadequate, the tenability of such relations is rejected.

6.2 Research Development Phase

As discussed previously in Chapter 5, this research investigation is divided into three inter-dependent phases. These phases are – Research Planning, Research Development and Research Validation, as depicted in the figure 6.1 below.

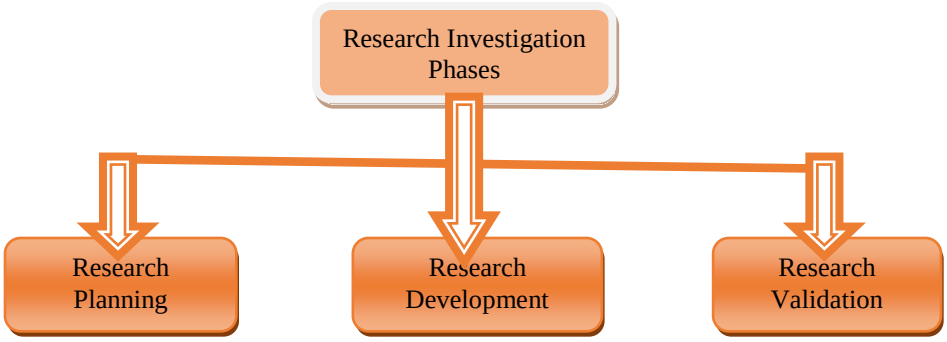


Figure 6.1: Research Investigation Phases

In this chapter, the **Research Development** activities are detailed. The research development activities included Pilot Study and Analysis, Factor Analysis using SPSS software tool and creation of model of trust using structural equation modelling using IBM AMOSv22. The Pilot study interview instrument was created on basis of variables found after literature review and discussion. This survey instrument was used to elicit information from a sample set of virtual team professionals and practitioners. Later this information was analysed qualitatively and it helped in refining questionnaire and interview instrument. The respondents for the questionnaire survey were chosen to be graduates working in virtual project team either as team members or project managers of various construction companies in the Middle East. The questionnaire survey was designed by using web based technique and a link to online questionnaire was sent to the participants. This data was later fed in the SPSS software for factor analysis that helped the researcher to finalise the factors responsible for building of trust in virtual project teams. Then, the structural equation modelling was used to create the final structural model which is used for testing of hypotheses.

6.2.1 Pilot Study

A pilot study is done to perform the pre-testing of particular research instrument (Van et al., 2001). One of the advantages of conducting a pilot study is that it detects the places where the project may fail. It informs the researcher whether proposed methods are appropriate or not and whether a defined set of protocols are defined or not (Van et al., 2001). Therefore, the aim of the Pilot Study is to validate the researcher's synthesis of the

literature in the field, by testing the adequacy of the research instruments and thereby assisting in development of the Primary Data Collection Instrument to be used in the actual data collection.

The pilot study here was used to assess the clarity, explicitness, meaning, and suitability of the questions provided in capturing the factors responsible for trust development for the construction industry of the Middle East. An initial version of the questionnaire having fifty four items was developed after comprehensive literature review. The pilot study was conducted to further refine the clarity of the instructions and the questions on the questionnaire. Finally, using the modified final questionnaire, consisting of thirty two items, the final data from construction professionals are collected for testing the causal model and the hypotheses.

6.2.1.1 Pilot Study – Survey Instrument

The Pilot study instrument was created on basis of variables found after literature review and discussion. This survey instrument was used to elicit information from a sample set of virtual team professionals and practitioners. This information was needed to know the quality and clarity of questionnaire. Questions were phrased so as to collect quantitative data using appropriate scales. The types of questions used in the questionnaire were mainly of the *closed ended question* type which enables the respondents to give answers that fit into categories that have been established in advance by the researcher. A 5-point Likert scale was employed to enable the respondents to rank the importance of each factor from a minimum of "strongly disagree" to a maximum of "strongly agree". In this questionnaire, the *open ended question* design is only dedicated to get information on respondent's profile and their work description. A Five-point Likert-type scale was used to increase response rate and response quality along with reducing respondents' "frustration level" (Babakus, 1992). Finstad, K. (2010) and Leung, S. (2011) recommended to use a 5-point scale for a larger study (N>100), but in a smaller study (N<100) use 7-point scales for better data distribution. A five-point scale rather than a seven-point scale was chosen for a number of reasons, one being that it became possible

to compare reliability coefficients with other research using five-point Likert Scales (Saleh, F. and Ryan, C., 1991).

At the start of the Questionnaire, "Ethical Considerations for the Research" was listed for the information of the participants. The participant was requested to give their consent for the data collection. The questionnaire was divided into three sections and initially consisted of fifty four items. Section 1 was on demographic information of respondents along with their experience on virtual projects, Section 2 seeks information about the organizational culture and leadership skills of the superior and Section 3 deals with information about the dynamics and communication of Virtual Project Team dealing with the internal working of the team along with the characteristics of team members. A copy of the Pilot Study – Survey Instrument has been included in the Appendix VI of this report.

6.2.1.2 Pilot Study – Data Collection

The Pilot study was carried out with seven participants from construction sector. Their work experience ranged from Projects - Construction and Engineering, Automobile Industry and Manufacturing Industry, bids and proposals to Consultancy. These participants have worked in the construction industry as project managers, architects, engineers and had work experience in Oman, Dubai, Muscat, Sharjah, UK, US, Holland, Qatar and Saudi Arabia. Prior appointments with the selected participants were formally obtained well ahead of the actual interviews.

These participants were approached using an introduction email and explanation of the research objectives and the value of their participation. The Pilot Study was conducted using a combination of the Pilot Questionnaire and Semi-structured interview method though telephonic, web chat or in-person.The interviews were conducted via face to face meetings and the information was recorded through note taking. The interviews lasted for 1 hour 15 minutes on an average.

The table 6.1 below depicts the details of meetings during the Pilot Study. The data collected through semi-structured interviews were analyzed. Semi-structured interviews enabled the researcher to extract quality information through descriptive responses. Such quality information would not have been possible to collect by the use of only a closed ended Questionnaire.

The responses of each participant for pilot study are recorded in Appendix VII.

Table 6.1: Information about participants meetings

S.no.	Information	Participant #1	Participant #2	Participant #3	Participant #4	Participant #5	Participant #6	Participant #7
1	**Date and Time of Study**	7th Nov., 2015; 4.30p.m.– 6.00p.m.	27th Nov., 2015; 5.30p.m.–7.00p.m.	27th Oct., 2015; 2.00 pm– 4.00p.m.	30th Oct., 2015; 5.30p.m. – 7.00p.m.	14th Nov., 2015; 11.30a.m. – 12.30 p.m.	31st Oct., 2015; 4.30p.m. – 6.00p.m.	17th Nov.,2015; 11.00 a.m. – 1.15 p.m.
2	**Venue**	Coffee Shop, Diera City Centre	----	Pizza Hut, Academic City, Dubai	---	Residence, Sheikh Zayad Road	Coffee shop, Fujairah City Centre	Ajman City Centre, Ajman
3	**Type of Study**	Personal Meeting	Online Interview-Skype	Personal Meeting	Online Interview-Skype	Personal Meeting	Personal Meeting	Personal Meeting
4	**Consent Obtained**	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	**Type of Experience**	Projects-Construction and Engineering, Automobile Industry, Manufacturing Industry	Bids and Proposals, Project Estimation	Construction, Consultancy	Construction , EPC	Consultancy, Contracting	Construction	Consultancy, Contracting
6	**Countries worked in**	Oman, UAE, India	India, UAE	Abudhabi, Sharjah, Dubai, Muscat	India, UAE	Oman, Dubai	Oman, India, UAE	US, UK, Holland, Mexico, India, UAE, Qatar , Saudi Arabia, Japan, Korea

6.2.1.3 Pilot Study – Analysis and Outcome

Almost all of the participants' feedback was positive with minor comments, mainly related to the interpretations and contexts of a few questions. As a result, the researcher rearticulated such questions using simpler expressions to avoid any future misunderstanding of the framework within which the response of the participants is sought. According to participants, there were few questions which were not required in the context of construction sector of the Middle East. Those questions were carefully removed. This resulted in the final and refined questionnaire having thirty two items as shown in Appendix VIII.

The researcher created the following consolidated table 6.2 from the meetings of seven professionals during pilot study. This table is designed after reviewing the notes taken during the meetings of pilot study. These comments were incorporated in the final revised questionnaire which is shown in Appendix IX.

Table 6.2: Consolidated comments by the participants of the Pilot Study

Participant #1	1 Definition of virtual project teams should be included before start of questionnaire. A list of definitions of few technical words would be helpful. 2 In the beginning of any project, kick off meeting (face to face) is very much required 3 Geographical Location does not play any hindrance to performance of team because of development of communication technologies. 4 Different skill set in a team is very effective for the team. 5 Most Engineering companies are moving to India for diversity in skills in a single person. 6 Conflict is very important to handle. It lies in the expertise of project manager to address it. If not addressed in time, it affects the trust in team too much. 7 Communication is very important for building trust. 8 The type of communication and training in it is equally important for information sharing among different project sites. 9 Proper information flow is much needed for performance of the team.

Participant #2	1. Definition of virtual project team should be included before start of questionnaire. 2. Include Diploma in Qualifications. 3. The team size and team tenure should be either average or current. 4. The cohesion among team members plays an important role in building trust. 5. Handling conflict among team members is a skill which is very much required by the project manager to build trust among the team members.
Participant #3	1. A list of definitions of some technical terms would be of help. 2. Definition of virtual project teams. 3. Rewording of some questions is required. 4. There is a time and holidays difference among countries, which results in delay in replies for the project. 5. If trust is not there, it affects information sharing in a big way and results in the delay of projects.
Participant #4	1. Few definitions of technical terms are needed. 2. Include diploma qualifications. 3. Average or current team size and team tenure. 4. Time difference and holidays also matters a lot. 5. Communication, Diversity and organizational culture greatly affect the trust among the team members of the team. 6. Lack of rewards or differences in salaries greatly affects the trust.
Participant #5	1. Definition of Virtual Project team should be included before start of questionnaire. 2. Mismatch of weekends and time. This results in delay of project execution because of lack of information flow during that period. 3. The working culture of a company is greatly affected by language barrier, cultural barrier (demographic) and work ethics. 4. For people management, trust is very important. The fellow team members sometimes do not share information due to being scared or just being wicked. They try to hold things till the end due to lack of trust with the fellow members and create havoc for the project. 5. There is a gender difference which also exists in the companies as the male subordinates do not share information with female boss whereas they support completely their male bosses.

	6. Salary differences and incentives create a distrust among the team members of the team. 7. Biasing with respect to their community exists in the companies. The bosses tend to favour their regional or country men. 8. There is a time and holidays difference among countries, which results in delay in replies for the project.
Participant #6	1. A list of few definitions is desired. 2. Include certificate course or diploma in qualifications. 3. Task- technology fit greatly motivates the team and hence builds the trust among the team members. 4. The presence of certain characteristics of team members such as professionalism, dedication, integrity, ability to do work etc. plays great role in building trust among team members.
Participant #7	1. Definition of VT should be included before start of questionnaire. 2. Rewording of some questions is required. 3. Instead of project manager, write superior or supervisor. 4. Instead of corporate, write organization. 5. Biasing has to be explained properly and it's something which is not shown explicitly and cannot be done anything for it if it exists in the company.

As a result of the pilot tests, a number of adjustments were made to the questionnaire:

- A new item was added to the educational qualification in section 1- Demographics i.e. "Diploma". Ph. D qualification was removed because according to the experts, we may not find team members and project managers of virtual project teams as Ph. D holders. Basically the experts with such a higher degree may act as consultants in many construction companies at the same time.
- It was advised in the pilot study to give a tool tip to have better understanding of terms such as "Average size of virtual project teams" and "Average tenure of virtual project teams". Following this, the required tool tip was added with these questions.

- For section 2, it was suggested to keep the name as "Organizational Culture" instead of "Corporate culture".
- The items in Team Evaluation for question 1 in section 2 of questionnaire was reframed to make more meaningful statement as it was not needed to have 4 items and they can be combined to generate a single item having the same meaning.
- It was advised to rename question 2 for section 2 as "Leadership skills of your Superior" instead of "Leadership skills of project manager" to make it more generalized to adjust both kinds of respondents- team leaders and team members.
- In section 3, for question 1, the meaning of "Functional Expertise" was sought after. Thereafter the suggestion was incorporated. Also the item "The team members are not virtuous" was advised to eliminate as the same meaning can be taken from another question in the section.
- For question 3 in the same section, the item on "Comfort with computers" are advised to be removed as these days, without knowledge of computers, it's difficult to survive in industry.
- Wording of the few questions was changed to make the questions more relevant and realistic.
- The language of some questions was further simplified to avoid misunderstanding by non-native English speakers.
- In the last section of pilot questionnaire, few general questions were asked such as:
    i. Were the questions clear and understandable?
    ii. The concept of research was clearly understood by the nature of questions.
    iii. What do you think about the wording of questions?
    iv. What do you think about the length of the questionnaire?

  The answers to these questions by experts gave an insight to the researcher about the overall understanding of the questionnaire. At the same time, the responses to

these questions were needed so that the final questionnaire does not become burden to the actual respondents.

6.2.2 Questionnaire Survey

The Questionnaire Survey sheet was constructed on the basis of the analysis of comprehensive Literature Review and Pilot Study. The respondents for the questionnaire survey were graduates working in virtual project team either as team members or project managers of various construction companies in the Middle East. The mailing lists of virtual team project communities were obtained from the online directories of construction companies such as www.gulfconstructionworldwide.com and www.constructionweekonline.com along with various other sources such as Emirates Oil and Gas directory, Middle East Building and Construction Directory, The Blue Book Building and Construction Network and LinkedIn Construction groups. The questionnaire survey was web based and the participants were sent a link to online questionnaire instrument. There was a consent form as a first page of the questionnaire which clearly stated the purpose of data collection; the process of data collection; how will the data be used; what measures are in place to ensure data security; when will the data be destroyed; the scenario of them changing their minds and deciding to withdraw from this study. It has clearly been stated in the consent letter that if they choose to withdraw then the data in the electronic form will be destroyed immediately. Only when the participants accept the consent form, they were directed to the questionnaire. Their responses are automatically recorded in the software tool (Survey Monkey) being used for making online questionnaire. The respondents who responded become self-sampled population. This data was fed in the SPSS for further processing that refined the researcher's theoretical model of trust constructed in chapter 4.

The types of questions used in the questionnaire were mainly of the *closed ended question* types which enable the respondents to give answers to fit into categories that have been established in advance by the researcher. A 5-point Likert scale was employed to enable the respondents to rank the importance of each factor from a minimum of "strongly disagree" to a maximum of "strongly agree". In this questionnaire, the *open*

ended question design is only dedicated to get information on respondent's profile and their work description. The questionnaire was divided into three sections. Section 1 was on demographic information of respondents along with their experience on virtual projects, Section 2 seeks information about the organizational culture and leadership skills of the superior and Section 3 deals with information about the dynamics and communication of Virtual Project Team dealing with the internal working of the team along with the characteristics of team members. Section 4 has items dealing with trust development.

There was a reference table being prepared for each item included in the questionnaire which clearly stated the purpose of that particular item and its importance by seeing its relevance in the reference column. It included section 2, 3 and 4 of the questionnaire as section 1 was demographic information. The Appendix X which shows the questionnaire reference table, gave the researcher, a strong belief that the research is going in the right direction.

6.2.2.1 Data Tabulation

Data was collected from 403 professionals from Construction sector of the Middle East through a web based questionnaire. This web based questionnaire was refined from the outcomes of pilot study and is shown in Appendix VIII. This was being prepared with the help of online tool – SURVEY MONKEY. The snapshot of the total number of responses is as shown in figure 6.2.

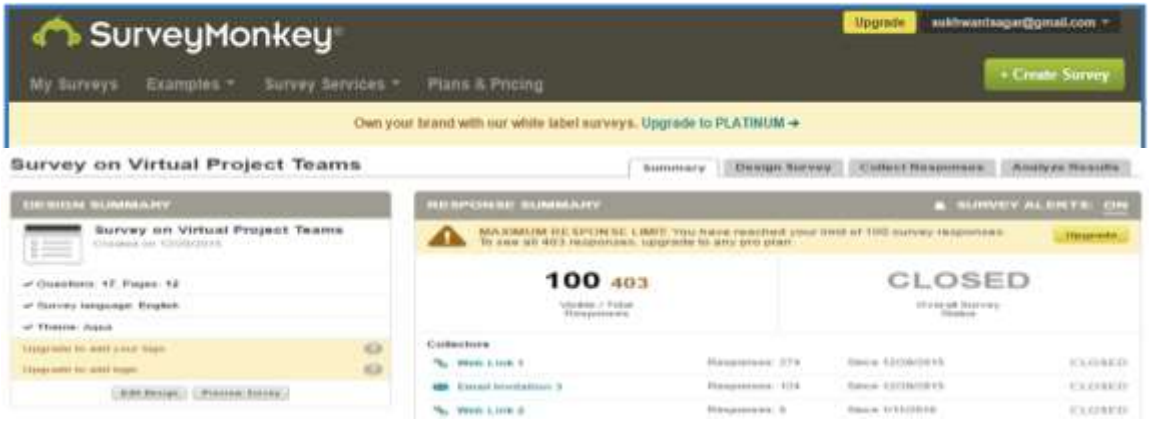
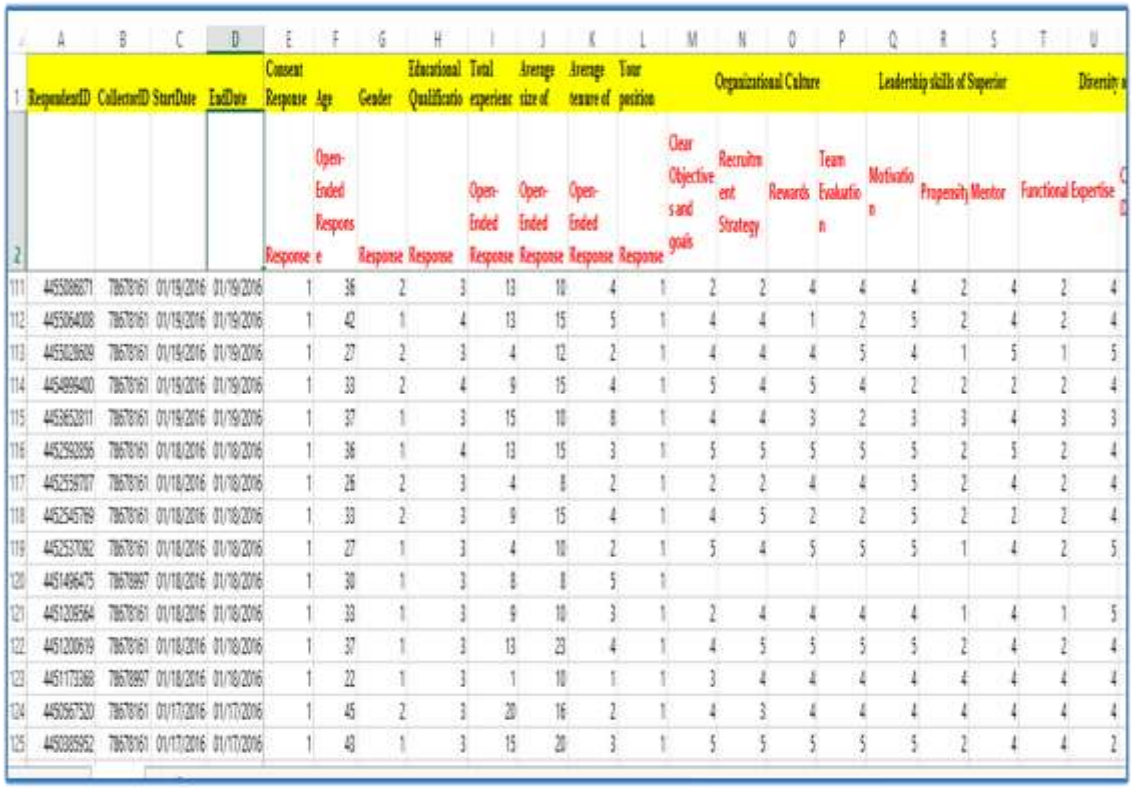


Figure 6.2: Number of responses with varied collectors

This online tool automatically preserves the data collected in the tabulated format. The tabulate is as shown in figure 6.3.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	RespondentID	CollectorID	StartDate	EndDate	Consent Response	Age	Gender	Educational Qualificatio	Total experienc	Average size of	Average tenure of	Your position	Organizational Culture				Leadership skills of Superior				Diversity o
2					Response	Open-Ended Respons e	Response	Response	Open-Ended Response	Open-Ended Response	Open-Ended Response	Response	Clear Objective s and goals	Recruitm ent Strategy	Rewards	Team Evaluatio n	Motivatio n	Propensity	Mentor	Functional Expertise	C D
111	445386871	78678161	01/19/2016	01/19/2016	1	36	2	3	13	10	4	1	2	2	4	4	4	2	4	2	4
112	445364008	78678161	01/19/2016	01/19/2016	1	42	1	4	13	15	5	1	4	4	1	2	5	2	4	2	4
113	445328689	78678161	01/19/2016	01/19/2016	1	27	2	3	4	12	2	1	4	4	4	5	4	1	5	1	5
114	445486400	78678161	01/19/2016	01/19/2016	1	33	2	4	9	15	4	1	5	4	5	4	2	2	2	2	4
115	445363811	78678161	01/19/2016	01/19/2016	1	37	1	3	15	10	8	1	4	4	3	2	3	3	4	3	3
116	445298356	78678161	01/18/2016	01/18/2016	1	36	1	4	13	15	3	1	5	5	5	5	5	2	5	2	4
117	445239707	78678161	01/18/2016	01/18/2016	1	26	2	3	4	8	2	1	2	2	4	4	5	2	4	2	4
118	445245789	78678161	01/18/2016	01/18/2016	1	33	2	3	9	15	4	1	4	5	2	2	5	2	2	2	4
119	445237082	78678161	01/18/2016	01/18/2016	1	27	1	3	4	10	2	1	5	4	5	5	5	1	4	2	5
120	445149475	78678997	01/18/2016	01/18/2016	1	30	1	3	8	8	5	1									
121	445120956	78678161	01/18/2016	01/18/2016	1	33	1	3	9	10	3	1	2	4	4	4	4	1	4	1	5
122	445120619	78678161	01/18/2016	01/18/2016	1	37	1	3	13	23	4	1	4	5	5	5	5	2	4	2	4
123	445117368	78678997	01/18/2016	01/18/2016	1	22	1	3	1	10	1	1	3	4	4	4	4	4	4	4	4
124	445056720	78678161	01/17/2016	01/17/2016	1	45	2	3	20	16	2	1	4	3	4	4	4	4	4	4	4
125	445038952	78678161	01/17/2016	01/17/2016	1	43	1	3	15	20	3	1	5	5	5	5	5	2	4	4	2

Figure 6.3: Snapshot of data collected using Online tool Survey Monkey

As we can see from the tabulated data,the software automaticaly allocates a respondent Id for each participant response. There are five collectors available in Survey Monkey as shown in figure 6.4 . The researcher used two kinds of collectors: Web Link and Email Invitation. That's the reason, there are two different numbers in Collector id column in figure 6.3.

Figure 6.4 : Types of Collectors available in Survey Monkey

Thereafter, the start and end date of the response was recorded. The survey options were being set in such a way to make survey anonymous which is shown in figure 6.5.

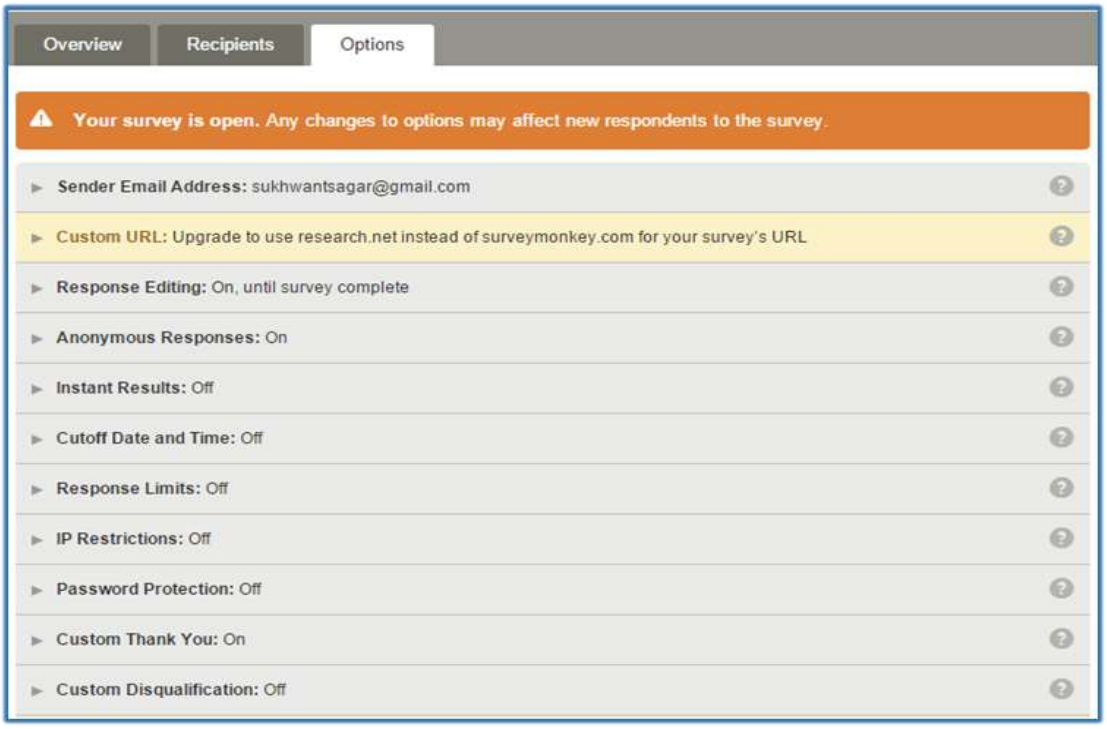


Figure 6.5: Options for each collector id in Survey Monkey

In column E of figure 6.3, the consent form information is recorded. It is one (1) if the respondent has agreed to fill the questionnaire voluntarily after understanding the research and zero (0) otherwise. After column E, in all other columns, the information of respective responses for the questionnaire is stored. We can see S. No. 120 has not completed the questionnaire and left in between. This is what we call one category of invalid response and can be found using MS-Excel by using formulae to find and delete such kind of responses.

6.2.2.2 Data Analysis using SPSS

Statistical Analysis software – Statistical Package for the Social Sciences (SPSS) was used to aid the analytic process in this research. Tabulated data was exported to the SPSS and analyzed using statistical research methods, as explained below.

A. Descriptive Statistics

1. Total number of Participants (Valid Data)

There were 403 participants, but after filtering the data for missed values, the resultant was 329. Then the file was checked for unengaged responses. Some respondents have entered '3,3,3,3..' or '1,1,1,1,2,2,2,2,3,3,3..'. These respondents were clearly not engaged, therefore those cases were removed. These were total 6 in number leaving behind a total of 323. The data is also checked for outliers. The outlier was found for 'average size of virtual team', which is later transformed and recoded by the median of all values for this particular variable. This resulted in a file with no outliers. Hence the final number of respondents came out to be 323 as shown in table 6.3.

Table 6.3: Summary of cases (participants)

Case Processing Summary						
	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
Cases	323	100.0%	0	0.0%	323	100.0%

2. Age Wise Distribution

The age distribution was from 25 years to 57 years as shown in table 6.4 with an average age of 39 years. From this data, it looks like the respondents were mature enough to answer the questionnaire.

Table 6.4: Age -wise Distribution

Statistics		
Age		
N	Valid	323
	Missing	0
Mean		39.23
Median		38.00
Mode		37
Std. Deviation		5.766
Minimum		25
Maximum		57

3. Gender Wise Distribution

Of 323 participants, 216 were male and 107 female as shown in table 6.5.

Table 6.5: Gender wise Distribution

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	216	66.9	66.9	66.9
	Female	107	33.1	33.1	100.0
	Total	323	100.0	100.0	

4. Educational Qualification wise Distribution

From the table 6.6 shown below, around 194 respondents are shown to have Bachelor's Degree, 102 respondents claimed that they have a Master's degree whereas only 27 reported to have diploma. This shows that the respondents collected so far are graduates and are having the ability to understand the research.

Table 6.6: Educational Qualification wise Distribution

Edu_Qual					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Diploma	27	8.4	8.4	8.4
	Bachelor's Degree	194	60.1	60.1	68.4
	Master's Degree	102	31.6	31.6	100.0
	Total	323	100.0	100.0	

5. Experience of working in Virtual Project Team (in Years)

The respondents had great experience working in Virtual project teams in Middle East with a mean of 6.9 years as shown in table 6.7. This actually amounts to the total experience of working in virtual project teams.

Table 6.7: Experience wise distribution

Statistics		
Total_Exp		
N	Valid	323
	Missing	0
Mean		6.97

Median	6.00
Mode	4
Std. Deviation	3.238
Minimum	2
Maximum	18

6. **Average Size of Virtual Project team**

The average size of virtual project teams in which respondents have worked in comes out to be 9 as shown in table 6.8 with minimum of 3 people and maximum of 18 people in a team. This further validates that these teams are created on need basis and are very specific to their job description.

Table 6.8: Size of virtual project teams (worked in)

Statistics		
Avg_size		
N	Valid	323
	Missing	0
Mean		9.98
Median		10.00
Mode		10
Std. Deviation		3.118
Minimum		3
Maximum		18

7. **Average Tenure of Virtual project teams**

Tenure refers to the average life of the team in years. As shown in table 6.9, the average tenure of virtual project teams where the respondents have worked in, is only 3.05. This verifies the definition of virtual project teams which says that virtual project teams are short lived, and are created only for the fulfillment of specific projects in different geographically dispersed locations.

Table 6.9: Tenure of virtual project team (worked in)

Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Avg_Tenure	323	1	9	3.05	1.347

8. Position wise Distribution of participants

Of all the respondents who answered the questionnaire, 73.7% were team members and 26.3 % were team leaders. In this research, since trust among team members is the main component to be analyzed, it is considered as good to have maximum data from team members which is evident from below table 6.10.

Table 6.10: Educational Qualification wise Distribution

Pos					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Team Member	238	73.7	73.7	73.7
	Team Leader	85	26.3	26.3	100.0
	Total	323	100.0	100.0	

B. Reliability Analysis

Cronbach's alpha is the most common measure of internal consistency ("reliability"). It is most commonly used when we have multiple Likert questions in a survey/questionnaire that form a scale and we wish to determine if the scale is reliable. A "high" value for alpha does not imply that the measure is one-dimensional. If, in addition to measuring internal consistency, we wish to provide evidence that the scale in question is one-dimensional, additional analyses can be performed. Exploratory factor analysis is one method of checking dimensionality. Technically speaking, Cronbach's alpha is not a statistical test - it is a coefficient of reliability or consistency (UCLA, 2007). In other words, the reliability of a measure is an indication of the stability and consistency with which the instrument measures the concept and helps to assess the "goodness" of a measure (Uma Sekaran & Roger Bougie, 2009). Internal Consistency of Questionnaire Scale was computed using Cronbach's Alpha method, as shown in table 6.11.

Table 6.11: Reliability Analysis (Cronbach's alpha)

Reliability Statistics	
Cronbach's Alpha	N of Items
.799	32

Nunnally (1978) recommends reliabilities of 0.70 or better (but not much beyond than 0.80) for basic research and between 0.90 and 0.95 in cases where important decisions are to be made on the basis of the test scores. Nunnaly (1978) has indicated that a value of 0.70 is an acceptable reliability coefficient. As seen in table 6.11 above, the Cronbach's Alpha (α) coefficient for the 32 scale based questions = 0.799, which can be considered as good value. This value gives weight to the reliability of the questionnaire scale.

C. Normality of data

The normality of data is required to be verified as the researcher is going to have hypothesis testing of theoretical model of trust using Structural Equation Modelling analysis with the use of AMOS (Arbuckle, 2007). This requirement is rooted in large sample theory from which SEM methodology was spawned. Thus, before any analysis of data are undertaken, it is important to check that this criterion has been met.

Normality refers to the distribution of the data for a particular variable. The normality can be assessed by the following numerical and visual outputs:

i. Skewness and Kurtosis
ii. The Shapiro- Walk test
iii. Histograms, Normal Q-Q plots and Box plots

i. **Skewness and Kurtosis:** Lack of symmetry (skewness) and pointiness (kurtosis) are two main ways in which a distribution can deviate from normal. The values for these parameters should be zero in a normal distribution.

Skewness is a measure of symmetry or the lack of symmetry. A distribution or data set is symmetric if it looks the same to the left and right of the centre point. Skewness is not needed on 5-point Likert scale. Therefore, it will be found for descriptive variables like age, gender, position in the virtual team, etc. Table 6.12 shows the results of skewness.

Table 6.12: Skewness results

Statistics								
		Age	Gender	Edu_Qual	Total_Exp	Avg_size	Avg_Tenure	Pos
N	Valid	323	323	323	323	323	323	323
	Missing	0	0	0	0	0	0	0
Mean		39.23	1.33	3.23	6.97	9.98	3.05	1.26
Std. Deviation		5.766	.471	.589	3.238	3.118	1.347	.441
Skewness score		.934	.720	-.104	.880	.140	1.185	1.081

An absolute value of the score greater than 1.96 or lesser than -1.96 is significant at $P < 0.05$, while greater than 2.58 or lesser than -2.58 is significant at $P < 0.01$, and greater than 3.29 or lesser than -3.29 is significant at $P < 0.001$. In small samples, values greater or lesser than 1.96 are sufficient to establish normality of the data. However, in large samples (200 or more) with small standard errors, this criterion should be changed to ± 2.58 and in very large samples no criterion should be applied (that is, significance tests of skewness and kurtosis should not be used) (Field A, 2009).

Kurtosis is a measure of whether the data are peaked or flat relative to a normal distribution. That's data sets with high kurtosis tend to have a distinct peak near the mean, decline rather rapidly and have heavy tails. Data sets with low kurtosis tend to have a flat top near the mean rather than a sharp peak. A uniform distribution would be the extreme case. Table 6.13 shows the kurtosis data.

Table 6.13 Kurtosis data

		N		Kurtosis scores
		Valid	Missing	
Statistics	V1	323	0	1.859
	V2	323	0	1.302
	V3	323	0	.664
	V4	323	0	1.415
	V5	323	0	1.438
	V6	323	0	-.750
	V7	323	0	.986
	V8	323	0	-1.006
	V9	323	0	1.306
	V10	323	0	-1.166
	V11	323	0	.858
	V12	323	0	1.745
	V13	323	0	1.241
	V14	323	0	-.413
	V15	323	0	-.784
	V16	323	0	.479
	V17	323	0	1.552
	V18	323	0	-.494
	V19	323	0	1.546
	V20	323	0	.186
	V21	323	0	-.172
	V22	323	0	-.811
	V23	323	0	-1.084
	V24	323	0	-.743
	V25	323	0	1.234
	V26	323	0	-.714
	V27	323	0	.587
	V28	323	0	.101
	V29	323	0	1.206
	V30	323	0	.272
	V31	323	0	-.646
	V32	323	0	.074

As the sample for this research is large (>300), the absolute value of the score greater than 2.58 or lesser than -2.58 is significant at $p<0.01$. So from table 6.12 and table 6.13, it can be deduced that data is not skewed and does not show kurtosis also.

ii. The Shapiro- Walk test

SPSS provides the K-S (with Lilliefors correction) and the Shapiro-Wilk normality tests and recommends these tests are to be used only for a sample size of less than 50 (Elliott AC, 2007). The Shapiro–Wilk test utilizes the null hypothesis principle to check whether a sample came from a normally distributed population or not (Shapiro, 1965). The null-hypothesis of this test is that the population is normally distributed. Thus, if the *p*-value is

less than the chosen alpha level, then the null hypothesis is rejected and there is evidence that the data tested are not from a normally distributed population; in other words, the data are not normal. On the contrary, if the *p*-value is greater than the chosen alpha level, then the null hypothesis that the data came from a normally distributed population cannot be rejected (e.g., for an alpha level of 0.05, a data set with a *p*-value of 0.02 rejects the null hypothesis that the data are from a normally distributed population) (Field A, 2009) However, since the test is biased by sample size, the test may be statistically significant from a normal distribution in any large samples.

In this research, p-value for this test comes out to be less than 0.05 and it rejects null hypothesis. It is understood from (Oztuna D, 2006) that for small sample sizes, normality tests have little power to reject the null hypothesis and therefore small samples most often pass normality tests. For large sample sizes, significant results would be derived even in the case of a small deviation from normality. Therefore this test cannot be relied upon.

iii. **Histograms, Normal Q-Q plots and Box plots:** To discover the shape of the distribution in SPSS, a histogram is made and a normal curve is plotted. If the histogram does not match the curve, then the data may have normality issues. And same goes with Normal Q-Q and Box plots (Ghasemi, A, 2012). Other than two variables, all the Q-Q plots came to be fine.

So in summary, it is assumed through the results of normality tests that the given data is normalized and is ready to be used for Structural equation modelling.

D. Factor Analysis

Factor analysis operates on the notion that measurable and observable variables can be reduced to fewer latent variables that share a common variance and are unobservable, which is known as reducing dimensionality (Bartholomew, Knott, & Moustaki, 2011). These unobservable factors are not directly measured but are essentially hypothetical constructs that are used to represent variables (Cattell, 1973).There are two kinds of Factor Analysis:

i. Exploratory Factor Analysis (EFA): It is used to explore the dimensionality of a measurement instrument by finding the smallest number of interpretable factors needed to explain the correlations among a set of variables. EFA is used when a researcher wants to discover the number of factors influencing variables and to analyze which variables 'go together' (DeCoster, 1998). It provides procedures for determining an appropriate number of factors and the pattern of factor loadings primarily from the data (Fabrigar, Wegener, MacCllum, & Strahan, 1999). Exploratory factor analysis is a widely used statistical technique in the social sciences (Costello & Osborne, 2005).

ii. Confirmatory Factor Analysis (CFA): It is used to study how well a hypothesized factor model fits a new sample from the same population or a sample from a different population – characterized by allowing restrictions on the parameters of the model. CFA requires a researcher to specify a specific number of factors as well as to specify the pattern of zero and nonzero loadings of the measured variables on the common factors (Fabrigar et al., 1999).

It is said that when researcher has relatively little theoretical knowledge to make strong basis for the total number of common factors, EFA is more sensible approach. This is primarily because the number of plausible models might be so large that it would be impractical to specify and test each one in CFA. However, when there is sufficient theoretical and empirical basis for a researcher to specify the model, CFA is likely to be a better approach. This is because CFA allows for focused testing of specific hypothesis about the data (Finch &West, 1997).

It is also often useful to use EFA and CFA in conjunction with one another. An EFA can be conducted in an initial study to provide a basis for specifying a CFA model in a subsequent study (Fabrigar et al., 1999). This research is designed towards a model of trust for virtual project teams in construction sector of the Middle East. As there is scarcity of literature in this field in this part of the world, the barriers and drivers for trust building were understood from the literature of other countries. Then a theoretical model

of trust was proposed based on the hypothesis construction. Therefore, the factors were proposed based on the understanding of the relevance and definitions of all variables. But in order to understand the structure of correlations among measure variables, EFA needs to be conducted. Hence EFA provided a basis for CFA technique.

Requirements for Factor Analysis: The below listed are some of the requirements for conducting factor analysis(Yong & Pearce, 2013):

- To perform a factor analysis, there has to be uni-variate and multivariate normality within the data (Child, 2006). It is also important that data is checked for missing values and outliers (Field, 2009).
- For something to be labeled as a factor it should have at least 3 variables, although this depends on the design of the study (Tabachnick & Fidell, 2007). As a general guide, rotated factors that have 2 or fewer variables should be interpreted with caution. A factor with 2 variables is only considered reliable when the variables are highly correlated with each another ($r > .70$) but fairly uncorrelated with other variables.
- The recommended sample size is at least 300 participants, and the variables that are subjected to factor analysis each should have at least 5 to 10 observations (Comrey & Lee, 1992). A larger sample size will diminish the error in your data and so EFA generally works better with larger sample sizes.
- A factor loading for a variable is a measure of how much the variable contributes to the factor; thus, high factor loading scores indicate that the dimensions of the factors are better accounted for by the variables (Harman, 1976). Next, the correlation *r* must be .30 or greater since anything lower would suggest a really weak relationship between the variables (Tabachnick & Fidell, 2007).
- A heterogeneous sample is always preferred rather than a homogeneous sample as homogeneous samples lower the variance and factor loadings (Kline, 1994).

Components of Factor Analysis:

i. **Descriptives:** Priori to running EFA, the researcher confirmed that all requirements were met for EFA. First a correlation matrix is generated for all the variables. A correlational matrix is a rectangular array of correlation coefficients of the variables with each other. Once a correlation matrix is computed, the factor loadings are then analysed to see which variables load onto which factors. The process is as shown in figure 6.6

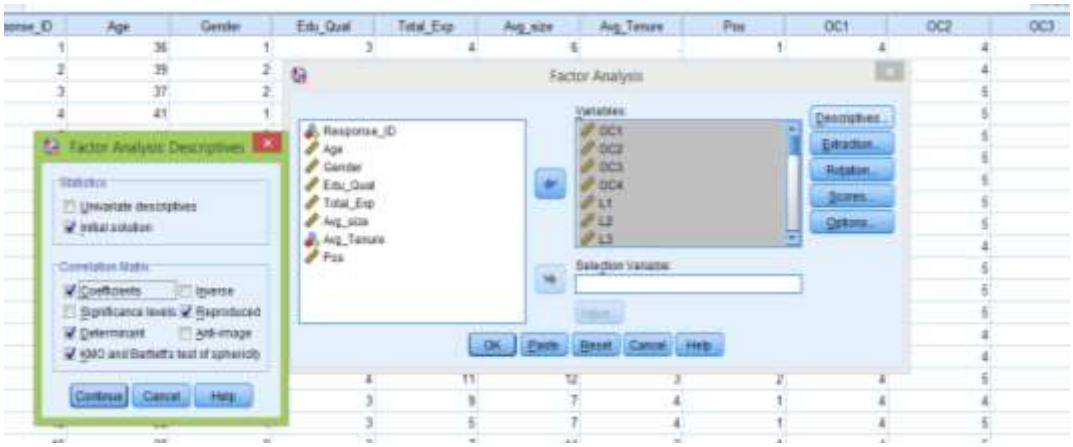


Figure 6.6: Setting up of descriptives

Each of the options available in the 'Factor Analysis Descriptive' dialog box in SPSS and their descriptions are shown in table 6.14.

Table 6.14 Options in Factor Analysis Descriptive dialog

Options	Descriptions
Univariate descriptives	Mean and standard deviation
Initial solution	Communalities estimate for the factors
Coefficient	R-matrix
Significance levels	Significance value matrix for the R-matrix
Determinant	Test for multicollinearity or singularity
KMO and Bartlett's	Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test
Inverse	Provides inverse of the correlation matrix
Reproduced	Correlation matrix for the model
Anti-image	Anti-image matrix of covariance and correlation

ii. **Factor Extraction:** The primary objective of this stage is to determine the factors. There is an array of extraction methods available: Unweighted least squares, Generalized least squares, Maximum likelihood, Principal axis factoring, Alpha factoring and Image factoring. A recent article by Fabrigar et al. (1999, p.

277) argued that if data are relatively normally distributed, maximum likelihood is the best choice because "it allows for the computation of a wide range of indexes of the goodness of fit of the model and permits statistical significance testing of factor loadings and correlations among factors and the computation of confidence intervals.". If the assumption of multivariate normality is "severely violated" they recommend one of the principal factor methods; in SPSS this procedure is called "principal axis factors" (Fabrigar et al., 1999). Maximum Likelihood attempts to analyze the maximum likelihood of sampling the observed correlation matrix (Tabachnick & Fidell, 2007). Maximum Likelihood is more useful for confirmatory factor analysis and is used to estimate the factor loadings for a population. Therefore it's being used in this research as shown in figure 6.7.

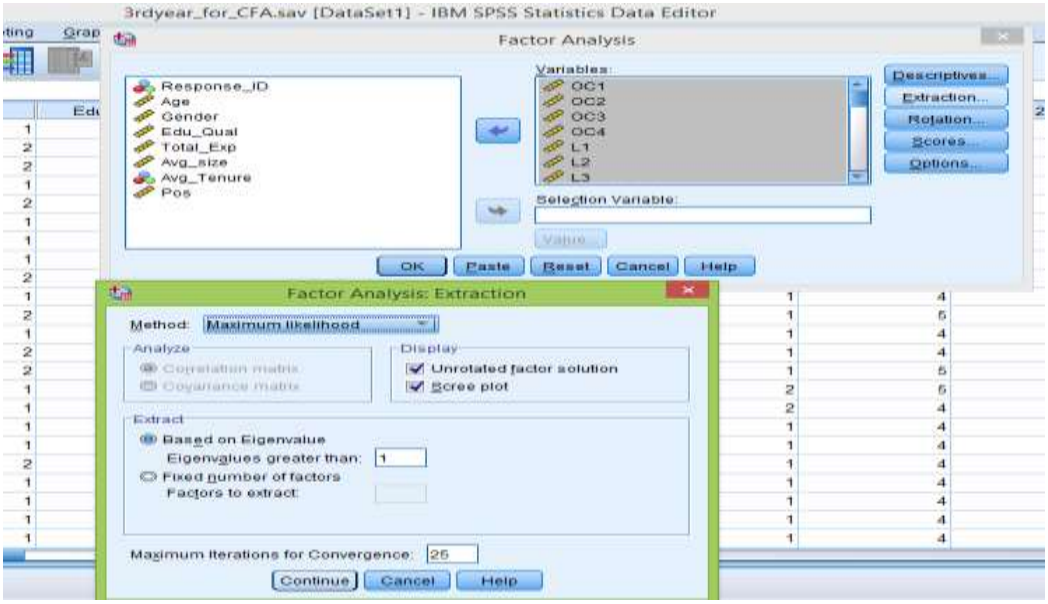


Figure 6.7 Factor Extraction

iii. **Rotation Methods:** Factors are rotated for better interpretation since unrotated factors are ambiguous**.** The goal of rotation is to attain an optimal simple structure which attempts to have each variable load on as few factors as possible, but maximizes the number of high loadings on each variable (Rummel, 1970). There are two kinds of rotations (Yong & Pearce, 2013):

- **Orthogonal Rotations:** Orthogonal rotation is when the factors are rotated 90° from each other, and it is assumed that the factors are uncorrelated (DeCoster, 1998; Rummel, 1970). This is less realistic since factors generally are correlated with each other to some degree (Costello & Osborne, 2005). Two common orthogonal techniques are Quartimax and Varimax rotation. *Quartimax* involves the minimization of the number of factors needed to explain each variable (Gorsuch, 1983). *Varimax* minimizes the number of variables that have high loadings on each factor and works to make small loadings even smaller
- **Oblique Rotations**: Oblique rotation is when the factors are not rotated 90° from each other, and the factors are considered to be correlated. Oblique rotation produces a pattern matrix that contains the factor or item loadings and factor correlation matrix that includes the correlations between the factors. The common oblique rotation techniques are Direct Oblimin and Promax. *Direct Oblimin* attempts to simplify the structure and the mathematics of the output, while *Promax* is expedient because of its speed in larger datasets. *Promax* involves raising the loadings to a power of four which ultimately results in greater correlations among the factors and achieves a simple structure (Gorsuch, 1983).

As this research deals with people and it's a part of social science, the researcher expect some correlation among factors, since behavior is rarely partitioned into neatly packaged units that are functionally independent. The pattern matrix is an output of oblique rotation which is needed for our research. Therefore, the researcher used promax rotation which is an oblique rotation which is shown in figure 6.8.

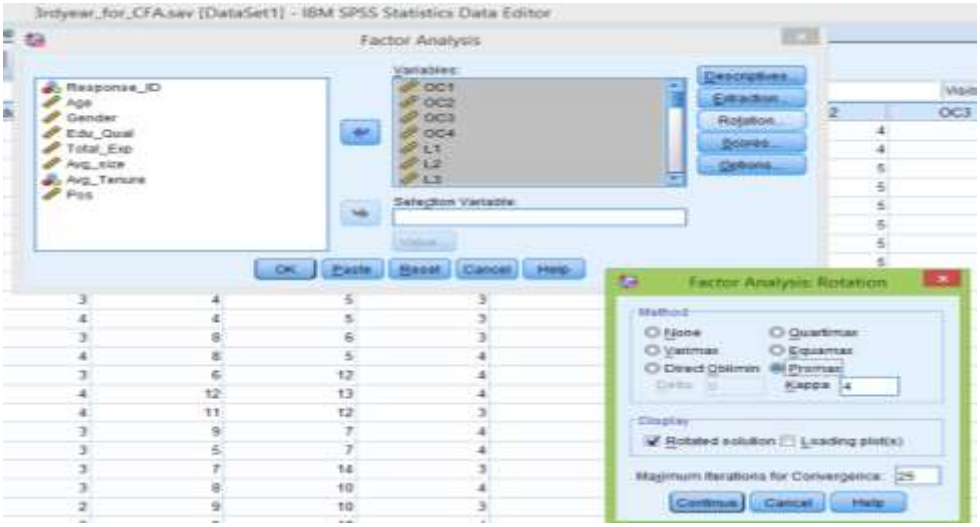


Figure 6.8: Factor rotation

iv. Interpretation of Factor Loadings: The loadings of the factors determine the strength of the relationships. Factors can be identified by the largest loadings, but it is also important to examine the zero and low loadings in order to confirm the identification of the factors (Gorsuch, 1983). There should be few item cross-loadings so that each factor defines a distinct cluster of interrelated variables. A cross-loading is when an item loads at 0.32 or higher on two or more factors (Costello & Osborne, 2005). The signs of the loadings show the direction of the correlation and do not affect the interpretation of the magnitude of the factor loading or the number of factors to retain (Kline, 1994). The reliability of the factor is determined by looking at the relationship between the individual rotated factor loading and the magnitude of the absolute sample size. That is, the larger the sample size, smaller loadings are allowed for a factor to be considered significant (Stevens, 2002). According to a rule of thumb, using an alpha level of .01 (two-tailed), a rotated factor loading for a sample size of at least 300 would need to be at least .32 to be considered statistically meaningful (Tabachnick & Fidell, 2007). This limit has been shown in figure 6.9.

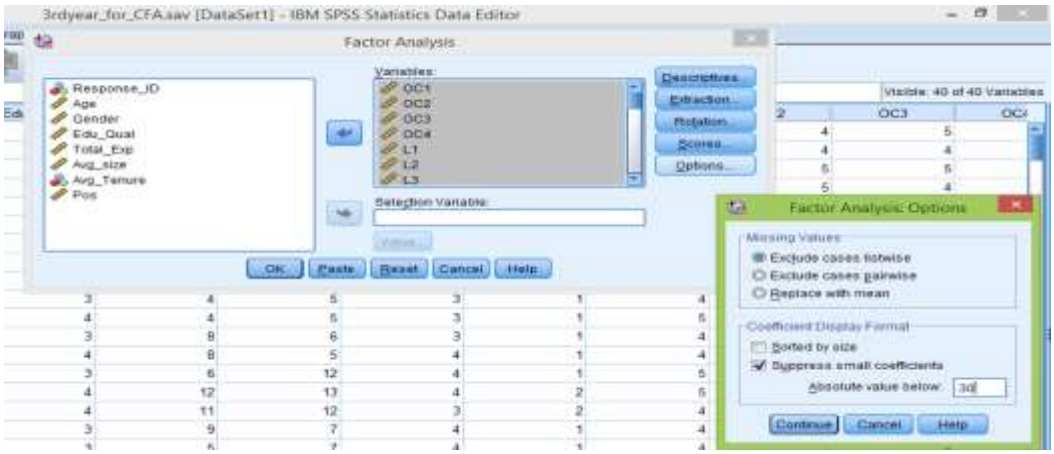


Figure 6.9: Factor analysis options

v. **Number of factors to retain:** The Eigen values and scree test are used to determine how many factors to retain. The scree test consists of eigenvalues and factors (Cattell, 1978). The number of factors to be retained is the data points that are above the break (i.e., point of inflexion). To determine the 'break', researchers draw a horizontal line and a vertical line starting from each end of the curve. The Scree test is only reliable when you have a sample size of at least 200.

Interpretation of the SPSS output:

i. ***Preliminary Interpretation:*** First , it is required to check data set for EFA. First the researcher checked for patterned relationship amongest the variables by referring to the ***Correlational matrix*** (Figure 6.10).Variables that have large number of low correlation coefficient (r < +/- 0.30) should be removed as they indicate a lack of patterened relationship (Yong & Pearce, 2013). Furthermore, correlations that are above r = +/- 0.90 indicate that the data may have a problem of multicollinearity. As a follow up, the ***Determinant score*** is checked to find whether it is above the rule of thumb of 0.00001 as this indicates the absence of multicollinearity (figure 6.11). the researcher found that the data does not have an issue of multicollinearity and there seem to be patterned relationship amongst the variables.

		V1	V2	V3	V4	V5	V6
Correlation	V1	1.000	.521	.417	.366	.358	.440
	V2	.521	1.000	.352	.392	.596	.432
	V3	.417	.352	1.000	.402	.365	-.380
	V4	.366	.392	.402	1.000	.360	.420
	V5	.358	.596	.365	.360	1.000	.336
	V6	.440	.432	-.380	.420	.336	1.000
	V7	.352	.373	.425	.342	.405	.380
	V8	.561	.452	.401	.587	.493	.481

Figure 6.10 Truncated SPSS output for Correlation Matrix.

Correlation Matrix[a]
a. Determinant = 2.74E-005

Figure 6.11 Determinant score

Second, the ***Barlett's Test of Sphericity*** (Figure 6.12; significant level of $p < 0.05$) is checked to confirm that our data has patterned relationships. Indeed, these tests show that there exists patterned relationships amongst the variables($p < 0.001$). Finally, ***Kaiser-Meyer Olkin Measure (KMO) of sampling Adequacy*** (figure 6.12; cut off above 0.50) and the diagonal element of Anti-Correlation matrix that has 'a' superscript (figure 6.13; cut-off of above 0.50 (H.F.KAISER, 1974) is checked. If this requirement is not met, this means that distinct and reliable factors cannot be produced. In that case, either the sample size needs to be increased or the item that's causing diffused correlation patterns should be removed. In this research, the data is suitable for EFA as the KMO is 0.828 and the individual diagonal elements were > 0.80. Both KMO and Barlett's test measures strength of the relatonship among variables.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.828
Bartlett's Test of Sphericity	Approx. Chi-Square	2599.799
	Df	300
	Sig.	.000

Figure 6.12 SPSS output for KMO and Barlett's Test

		V1	V2	V3	V4	V5
Anti-image Correlation	V1	.863[a]	-.326	-.167	-.066	-.045
	V2	-.326	.870 [a]	-.048	-.146	.016
	V3	-.167	-.048	.864 [a]	-.206	-.189
	V4	-.066	-.146	-.206	.876 [a]	-.095
	V5	-.045	.016	-.189	-.095	.865 [a]
	V6	.050	-.079	.170	-.136	-.119

Figure 6.13 Truncated SPSS output for the Anti-Image Correlation portion obtained from Anti-image Matrices. The Anti- image covariance portion is not shown.

ii. ***Factor Extraction and Rotation:*** The ***Total Variance Explained table*** (Figure 6.14) is looked upon to determine the number of significant factors. It is important to note that only extracted and rotated values are meaningful for interpretation. The factors are arranged in the ascending order based on the most explained variance. In our research, there happened to be seven main factors and all the remaining factors are not significant. The ***Extraction sum of Squared Loadings*** is identical to the Initial Eigenvalues except factors that have eigen values less than 1 are not shown. These columns show the eigenvalues and variance prior to rotation. The ***Rotation Sum of Squared Loadings*** show the eigen values and variance after rotation.

Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	5.772	23.089	23.089	2.121	8.484	8.484	3.748
2	2.621	10.485	33.574	4.296	17.186	25.670	3.050
3	2.115	8.460	42.034	1.985	7.938	33.608	2.541
4	1.675	6.699	48.733	1.553	6.212	39.820	2.327
5	1.203	4.814	53.547	.976	3.903	43.723	1.824
6	1.142	4.566	58.113	.866	3.465	47.188	2.448
7	1.015	4.060	62.173	.542	2.168	49.355	3.596
8	.917	3.666	65.840				
9	.833	3.333	69.173				
10	.779	3.117	72.289				
11	.688	2.751	75.040				
12	.620	2.482	77.522				
13	.608	2.434	79.955				
14	.565	2.258	82.214				
15	.547	2.186	84.400				
16	.504	2.018	86.418				
17	.458	1.834	88.251				
18	.436	1.743	89.995				
19	.431	1.723	91.717				
20	.411	1.645	93.362				
21	.396	1.585	94.948				
22	.357	1.428	96.376				
23	.332	1.328	97.704				

Figure 6.14: Truncated SPSS output for the total variance explained for extracted factors

The researcher used the rotated eigen values and scree plot (Figure 6.15) to determine the number of significant factors that came out to be seven in number.

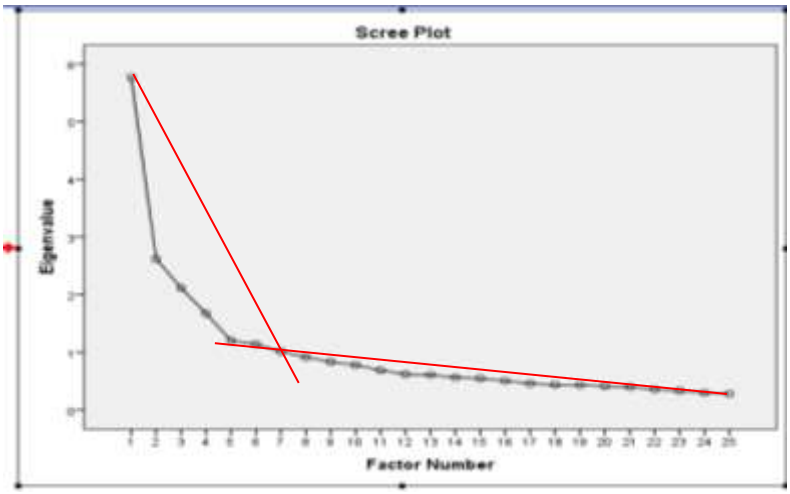


Figure 6.15: SPSS output for scree plot indicating that the data have seven factors

Next, it is needed to check if the model is fit by looking at the summary of the percentage of the non-redundant residuals at the Reproduced Correlation Matrix (Figure 6.16). A model that is a good fit will have less than 50% of the non-redundant residuals with absolute values that are greater than 0.05 which is true for our research data. For this research, there are only 8 % residuals between ***Reproduced Correlation Matrix*** with the original ***Correlation Coefficients Matrix***.

Extraction Method: Maximum Likelihood.

a. Reproduced communalities

b. Residuals are computed between observed and reproduced correlations. There are 26 (8.0%) nonredundant residuals with absolute values greater than 0.05.

Figure 6.16 Non- Reduntant residuals at the Reproduced Correlation Matrix

The ***Pattern Matrix*** (Figure 6.17) shows the factor loadings of each variables on seven factors. This is the result of promax rotation and suppressing small coefficients which helps in the interpretation. The factor loadings show that the factors are fairly desirable. The higher the absolute value of the loading, the more the factor contributes to the variable. The gap on the table represent loadings that are less than

0.30 which makes the reading of table easier. The researcher has suppressed all loadings below 0.30.

Pattern Matrix[a]

	Factor						
	1	2	3	4	5	6	7
V1	.833						
V2	.703						
V3	.542						
V4	.464						
V7	.356						
V17	.351						
V22		.769					
V23		.759					
V24		.629					
V21		.577					
V14			.843				
V15			.749				
V6			.675				
V8			.668				
V30				.876			
V29				.606			
V10					.696		
V11					.721		
V26					.706		
V28						.846	
V27						.794	
V12							.617
V19							.599
V20							.715
V13							.808

Extraction Method: Maximum Likelihood.
Rotation Method: Promax with Kaiser Normalization.[a]

a. Rotation converged in 7 iterations.

Figure 6.17: Pattern Matrix

iii. Is the rotation technique used suitable? : To determine whether a rotation technique is suitable, the off- diagonal elements of ***Factor Transformation Matrix*** are checked (figure 6.18). A suitable rotation technique will result in a nearly symmetrical off-diagonal element which is true in this research. Hence, Oblique rotation was suitable for this research.

Factor Correlation Matrix

Factor	1	2	3	4	5	6	7
1	1.000	.299	.166	.257	.135	.441	.500
2	.299	1.000	.200	.293	.071	.214	.465
3	.166	.200	1.000	.192	.323	.193	.174
4	.257	.293	.192	1.000	.347	.183	.401
5	.135	.071	.323	.347	1.000	.096	.124
6	.441	.214	.193	.183	.096	1.000	.389
7	.500	.465	.174	.401	.124	.389	1.000

Extraction Method: Maximum Likelihood.
Rotation Method: Promax with Kaiser Normalization.

Figure 6.18: Factor Correlation Matrix

iv. Reliability Analysis of factors after factor analysis: Reliability analysis test was performed for each of the factor i.e. variables contained in each factor. Again Cronbach's Alpha (α) was used to test the reliability of each factor formed as shown in figure 6.19.

Factor No.	**Factor name**	**Reliability Statistics**	
		Cronbach's Alpha	**No. of Items**
1.	Organizational Culture	.753	6
2.	Conflict within the team	.713	4
3.	Characteristics of the team members	.766	4
4.	Trust within the team members	.703	2
5.	Diversity of the team	.700	3
6.	Communication of the team	.757	2
7.	Cohesion in the team	.761	4

Figure 6.19: Reliability Statistics

Kline (1999) proved that although the generally accepted value of 0.7 is appropriate but for psychological constructs, values below even 0.7 can, realistically, be expected because of the diversity of the constructs being measured. Alpha is also affected by reverse scored items. These reverse phrased items are important for reducing response bias) participants will actually have to read the items in case they are phrased the other way around. In reliability analysis these reverse scored items make a difference: in the extreme they sometimes can lead to a negative Cronbach's alpha (Field, 2005)

v. Final steps: Naming of factors: There are no rules for naming factors, except to give names that best represent the variables within the factors. The following names for the factors were decided after the analysis of results as shown in table 6.15. By understanding the definitions of these variables form chapter 4, the variables have been given factor names.

Table 6.15: Factor Naming

Factor name	***Variables/ items***
Factor 1: Organizational Culture	V1 : Clear Objectives and Goals
	V2: Recruitment Strategy
	V3: Rewards
	V4: Team Evaluation
	V7:Availability of Mentor
	V17: Task Interdependence in the organization
Factor 2: Conflict within the team	V22: Conflict for execution of Task
	V23: Conflict for delegation of task
	V24: Relationship confliict
	V21: Lack of Employee Satisfaction
Factor 3: Characteristics of team members	V14: Integrity of the team member
	V15: Benevolence of the team member
	V16: Propensity to trust
	V8: Functional Diversity of the team
Factor 4: Trust within the team members	V30:Relying on the information provided by team
	V29:Accepting procedural suggestions from team
Factor 5: Diversity of the team	V10: Cultural Diversity
	V11: Differ in Problem Solving Approach
	V26: Time difference and holidays
Factor 6: Communication of the team	V28: Training on core technical skills
	V27:Training on personal development and conflict resolution.
Factor 7: Cohesion in the team	V12: Cognitive ability of the team
	V19:Mutual Respect within the team
	V20:Affective(Caring) elements within the team
	V13:Technical ability of team

6.2.2.3 Discussion

Factor analysis is used to identify latent constructs or factors. It is commonly used to reduce variables into a smaller set to save time and facilitate interpretations. The Maximum Likelihood extraction technique is used in this research. The oblique rotation is used as a rotation technique as the research involved correlated factors. The

interpretation of factor analysis is based on rotated factor loadings, rotated Eigen values and scree test.

The analysis in this research brought seven factors in limelight namely Organizational Culture, Conflict within the team, Characteristics of team members, Trust within the team, Diversity of the team, Communication of the team and Cohesion in the team. These factors are consistent with the factors which the researcher got after combining the 40 variables from comprehensive literature review. The combination of variables into factors was done after understanding their definition and relevance. These factors are considered as main latent constructs for the construction of model of trust for virtual project teams in construction sector of Middle East.

6.2.3 Structural Equation Modelling

Traditional statistical approaches to data analysis specify default models, assume measurement occurs without error, and are somewhat inflexible. However, structural equation modeling requires specification of a model based on theory and research, is a multivariate technique incorporating measured variables and latent constructs, and explicitly specifies measurement error (Suhr, 2006). A model (diagram) allows for specification of relationships between variables. The researcher used a multivariate statistical analysis which refers to multiple advanced techniques for examining relationship among multiple variables at the same time. Structural equation modelling (SEM) is a **second generation** statistical analysis techniques that takes a confirmatory (i.e., hypothesis-testing) approach to the analysis of a structural theory representing "causal" processes that generate observations on multiple variables (Bentler, 1988).

The hypothesized model can then be tested statistically in a simultaneous analysis of the entire system of variables to determine the extent to which it is consistent with the data. If goodness-of-fit is adequate, the model argues for the plausibility of postulated relations among variables; if it is inadequate, the tenability of such relations is rejected.

Similarities between Traditional Statistical Methods and SEM:

SEM is similar to traditional methods like correlation, regression and analysis of variance in many ways. First, both traditional methods and SEM are based on linear statistical models. Second, statistical tests associated with both methods are valid if certain assumptions are met. Traditional methods assume a normal distribution and SEM assumes multivariate normality. Third, neither approach offers a test of causality (Suhr, 2006).

Differences Between Traditional and SEM Methods:

- Traditional approaches differ from the SEM approach in several areas. First, SEM is a highly flexible and comprehensive methodology. This methodology is appropriate for investigating achievement, economic trends, health issues, family and peer dynamics, self-concept, exercise, self-efficacy, depression, psychotherapy, and other phenomenon.
- Second, traditional methods specify a default model whereas SEM requires formal specification of a model to be estimated and tested. SEM offers no default model and places few limitations on what types of relations can be specified. SEM model specification requires researchers to support hypothesis with theory or research and specify relations a priori.
- Third, SEM is a multivariate technique incorporating observed (measured) and unobserved variables (latent constructs) while traditional techniques analyze only measured variables. Multiple, related equations are solved simultaneously to determine parameter estimates with SEM methodology.
- Fourth, SEM allows researchers to recognize the imperfect nature of their measures. SEM explicitly specifies error while traditional methods assume measurement occurs without error.
- Fifth, traditional analysis provides straightforward significance tests to determine group differences, relationships between variables, or the amount of variance explained. SEM provides no straightforward tests to determine model fit. Instead, the best strategy for evaluating model fit is to examine multiple tests (e.g., chi-

square, Comparative Fit Index (CFI), Bentler- Bonett Non-normed Fit Index (NNFI), Root Mean Squared Error of Approximation (RMSEA)).

- Sixth, SEM resolves problems of multicollinearity. Multiple measures are required to describe a latent construct (unobserved variable). Multicollinearity cannot occur because unobserved variables represent distinct latent constructs.
- Finally, a graphical language provides a convenient and powerful way to present complex relationships in SEM. Model specification involves formulating statements about a set of variables. A diagram, a pictorial representation of a model, is transformed into a set of equations. The set of equations are solved simultaneously to test model fit and estimate parameters (Suhr, 2006):

Given these highly desirable characteristics, SEM has become a popular methodology for non-experimental research, where methods for testing theories are not well developed and ethical considerations make experimental design unfeasible (Bentler, 1980).

Statistics:

Traditional statistical methods normally utilize one statistical test to determine the significance of the analysis. Structural Equation modeling, however, relies on several statistical tests to determine the adequacy of model fit to the data (Suhr, 2006)

- The chi-square test indicates the amount of difference between expected and observed covariance matrices. A chi-square value close to zero indicates little difference between the expected and observed covariance matrices. In addition, the probability level must be greater than 0.05 when chi-square is close to zero.
- The Comparative Fit Index (CFI) is equal to the discrepancy function adjusted for sample size. CFI ranges from 0 to 1 with a larger value indicating better model fit. Acceptable model fit is indicated by a CFI value of 0.90 or greater (Hu & Bentler, 1999).
- Root Mean Square Error of Approximation (RMSEA) is related to residual in the model. RMSEA values range from 0 to 1 with a smaller RMSEA value indicating

better model fit. Acceptable model fit is indicated by an RMSEA value of 0.06 or less (Hu & Bentler, 1999).

If model fit is acceptable, the parameter estimates are examined. The ratio of each parameter estimate to its standard error is distributed as a z statistic and is significant at the 0.05 level if its value exceeds 1.96 and at the 0.01 level it its value exceeds 2.56 (Hoyle, 1995). Unstandardized parameter estimates retain scaling information of variables and can only be interpreted with reference to the scales of the variables. Standardized parameter estimates are transformations of unstandardized estimates that remove scaling and can be used for informal comparisons of parameters throughout the model. Standardized estimates correspond to effect-size estimates.

If unacceptable model fit is found, the model could be revised when the modifications are meaningful. Model modification involves adjusting a specified and estimated model by either freeing parameters that were fixed or fixing parameters that were free.

The aim in SEM, is to specify a model and such that it meets the criterion of over-identification because this state of identification yields models of scientific use. For this research, the researcher completed model specification and identification (theoretically). An exploratory factor analysis was conducted including 32 measured items of seven factors, using a maximum likelihood technique with an oblique rotation. After performing the exploratory factor analysis, a confirmatory Factor Analysis (CFA) is required to validate the factorial validity of the models derived from the results of EFA.
Structural Equation Modeling (SEM) was performed using the maximum likelihood method (ML) to test the hypotheses constructed during chapter 4. This procedure permitted an assessment of the integrity of the measures, as well as an evaluation of the degree to which the observed relations among variables fitted the hypothesized network of causal relationships.

The researcher employed IBM AMOSv22 Graphic (Analysis of Moments Structures) - the software developed for analyzing the Structure Equation Modeling (SEM). It is used

to model and analyze the inter relationships among latent constructs effectively, accurately and efficiently. The theoretical model of trust is directly converted into AMOS graphic for analysis. More importantly, using AMOS Graphic interface, the researcher created path diagrams using drawing tools, rather than by writing equations or by typing commands. This graphic helped the researcher to validate the measurement model of a latent construct using Confirmatory Factor Analysis (CFA). Once CFA is completed, the researcher could move into modeling the Structural Equation Modeling (SEM). Thus, analyzing and testing the theory using AMOS is fast, efficient, and user friendly.

The analyses were conducted in two stages. In the first stage, the measurement model was first tested to ensure that the constructs had sufficient psychometric validity. The second stage focussed on the assessment of the structural model in which the hypotheses were tested (Patnayakuni et al., 2007).

6.2.3.1 **Measurement Model**

To validate the measurement model, reliability, convergent validity and discriminant validity were assessed. For that to happen, first measurement model needs to be constructed. The following steps were performed to finalize the measurement model:

i. Obtain a roughly decent model quickly (cursory model fit, validity)

The pattern matrix from figure 6.17 is grabbed and copied to AMOS. The required data file is attached. After using the plugin of pattern matrix model builder, the researcher got the rough measurement model. After checking the analysis properties for the required parameters, the estimates are calculated for standard estimates and found regression coefficients > 0.7. The output nodes for model are checked and found degree of Freedom is positive indicating over-identified model. After working on modification indices, the researcher got measurement model as shown in figure 6.20.

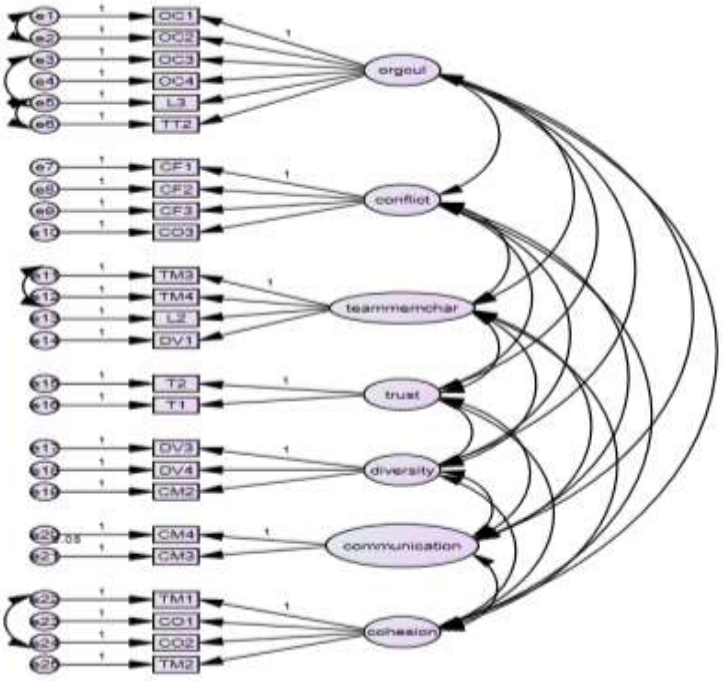


Figure 6.20 Measurement Model

Model fit Summary:

In structural equation modelling, the fit indices establish whether the model is acceptable or not. As it can be seen, the model is fit as shown in the following goodness- of- fit indices.

a) **CMIN/DF**: CMIN (Minimum discrepancy) refers to the use of the maximum likelihood estimation chi-square test to assess the fit of a model in confirmatory factor analysis and modelling and DF refers to Degrees of Freedom. CMIN/ DF are expected to be in the range of 3 to 1 and are indicative of an acceptable fit between the hypothetical model and the sample data (Carmines & McIver, 1981). The value came for model came to be 1.882 as shown in table 6.16.

Table 6.16: CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	71	385.834	205	.000	1.882

b) **RMR** (Root Mean Square Residual): It represents the square root of the average or mean of the covariance residuals - the differences between corresponding elements of the observed and predicted covariance matrix. RMS should be less than .08 (Browne & Cudeck, 1993). The value came to be 0.064 as shown in table 6.17.

c) **GFI** (Goodness of fit Index): It is a measure of the relative amount of variance and covariance in sample data. **GFI** is less than or equal to 1. A value of 1 indicates a perfect fit (Hu & Bentler, 1995). The value for this model came out to be 0.904 as shown in table 6.17.

d) **AGFI** (Adjusted Goodness of Fit): It differs from GFI only in the fact that it adjusts for the number of degrees of freedom in the specified model. The range specified for this index is from zero to 1 with values close to 1.00 being indicative of good model fit (Hu & Bentler, 1995). The value for this model came out to be 0.871 as shown in table 6.17.

e) PGFI (Parsimony Goodness-of-Fit Index): It is used to address the issue of parsimony which means the simplest model theory with the least assumptions and variables but with greatest explanatory power. PGFI takes into account the complexity (i.e. the number of estimated parameters) of the hypothesized model in the assessment of overall model fit. The acceptable range of PGFI indices needs to be in 0.50s (Byrne, B. M. ,2001). Thus, our finding of a PGFI value of 0.672 would seem to be consistent with our previous fit statistics.

Table 6.17: RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.064	.904	.871	.672

f) **CFI** (Comparative Fit Index): The CFI compares the fit of a target model to the fit of an independent model--a model in which the variables are assumed to be uncorrelated. In this context, fit refers to the difference between the observed and predicted covariance matrices, as represented by the chi-square index. Roughly, the CFI thus represents the extent to which the model of interest is better than the independence model. Values that approach 1 indicate

acceptable fit (Raykov, T., 2005). In our case, this value came out to be 0.913 which is acceptable.

Table 6.18: Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.835	.797	.915	.893	.913

g) **RMSEA** (Root Mean Square Error of Approximation): The RMSEA takes into account the error of approximation in the population and asks the question, "How well would the model, with unknown but optimally chosen parameter values, fit the population covariance matrix if it were available?" (Brown & Cudeck, 1993, pp 137-138). MacCallum et al. (1996) indicated that values less than 0.05 indicate good fit, values ranging from 0.08 to 0.10 indicate mediocre fit and those greater than 0.10 indicate poor fit. The value for our model is 0.052 which is a good fit.

Table 6.19: RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.052	.044	.060	.307

ii. Validity and Reliability check

In SEM, the reliability is evaluated using the composite reliability values. Acceptable values of the composite reliability values should be above 0.7 (Fornell & Larcker, 1981). Table 6.20 shows that all the values ranged from 0.71 to 0.79 and were all above the commonly accepted threshold 0.7.

In addition, the convergent validity of the scales can be verified by the condition that the average variance extracted (AVE) by each construct should exceed the variance due to measurement error for that construct (i.e., AVE should exceed 0.50) (Fornell & Larcker, 1981). For the current measurement model, AVE ranged from 0.52 to 0.66 (see Table 6.20).

Table 6.20: Validity and Reliability Values

	CR	AVE	MSV	Communication	OrgCul	Conflict	Team Mem Char	Trust	Diversity	Cohesion
Communication	0.795	0.669	0.326	**0.818**						
OrgCul	0.743	0.567	0.458	0.571	**0.752**					
Conflict	0.731	0.564	0.311	0.179	0.304	**0.751**				
Team member Char	0.758	0.551	0.158	0.148	0.135	0.063	**0.742**			
Trust	0.783	0.520	0.325	0.346	0.383	0.425	0.285	**0.721**		
Diversity	0.716	0.588	0.089	0.038	0.059	-0.043	0.298	0.200	**0.767**	
Cohesion	0.726	0.573	0.458	0.448	0.677	0.558	0.398	0.570	0.144	**0.756**

Discriminant validity can be verified by examining that the square root of the AVE from the construct should be greater than the correlations shared between the construct and other constructs in the model (Fornell & Larcker, 1981). Table 6.20 lists the correlations among the constructs, with the square root of the AVE on the diagonal. The diagonal values all exceed the inter-construct correlations, a condition which indicates the satisfactory discriminant validity of all constructs.

iii. Common method bias (marker if possible, CLF otherwise)

Common method bias (CMB) happens when variations in responses are caused by the instrument rather than the actual predispositions of the respondents that the instrument attempts to uncover. In other words, the instrument introduces a bias, hence introduces variances. Consequently, the results are contaminated by the 'noise' stemming from the biased instruments.

One of the simplest ways to test if CMB is of concern in our study, the researcher used a marker variable (and CLF) and constrain the paths from the CLF to zero, and

then compare (using chi-square difference test) this model to an unconstrained model. The results would indicate that if a model with zero method variance is different from the unconstrained model.

The analysis results of common method bias as shown in table 6.21 shows that the groups are not different at model level. There is no issue of common method bias. So it is not needed to add CLF in the model.

Table 6.21: Analysis results of Common Method Bias

	Chi-square	df	p-val	Invariant?	
Overall Model					Step 1. Provide chi-square and df for unconstrained and constrained models, and provide the number of groups. The thresholds (green cells) will be updated automatically.
Unconstrained	316.277	128			
Fully constrained	300.62	147			
Number of groups		2			
Difference	15.657	19	0.680	YES	Groups are not different at the model level, however, they may be different at the path level.
Chi-square Thresholds					
90% Confidence	318.98	129			Any chi-square more than the threshold (Green Cells) will be variant for a path by path analysis. This is only applicable to models where you are changing one path at a time (i.e., have a difference of one degree of freedom)
Difference	2.71	1	0.100		
95% Confidence	320.12	129			
Difference	3.84	1	0.050		
99% Confidence	322.91	129			
Difference	6.63	1	0.010		

iv. Final measurement model fit

The final measurement model achieved is as shown in figure 6.21 and the goodness of fit statistics is shown in table 6.22 to table 6.25. The goodness of fit indices resulted in model fit as their values fell in the range as discussed in the 6.2.3.1 part i.

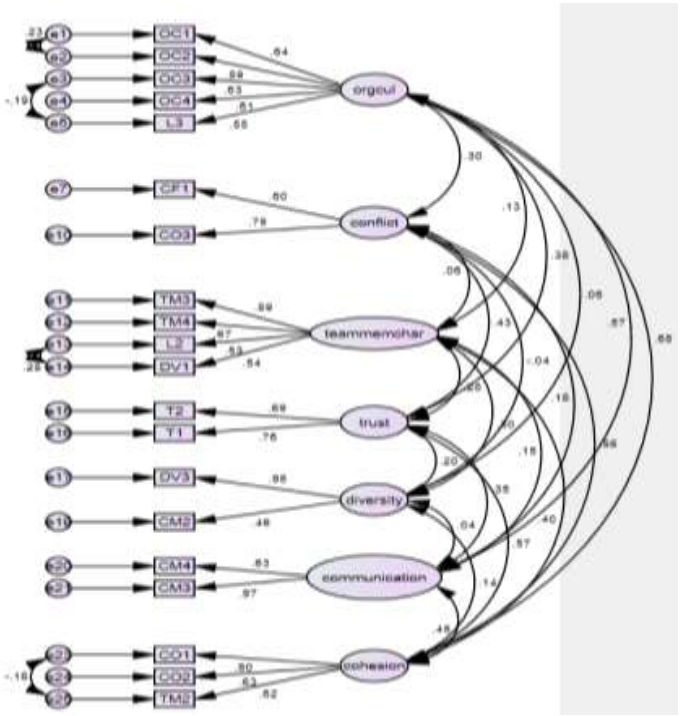


Figure 6.21: Final Measurement Model

Table 6.22: CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	63	300.620	147	.000	2.045

Table 6.23: RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.070	.913	.876	.639

Table 6.24: Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.845	.800	.915	.887	.912

Table 6.25: RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.057	.048	.066	.104

6.2.3.2 Structural Model and Hypothesis testing

After the outline of an adequate measurement model, the researcher proceeded to test the proposed hypothesis with AMOS SEM. In this analysis, the structural paths and the R-

square scores of endogenous variables are examined to assess the explanatory power of the structural model. Structural Equation modelling is a multivariate analysis technique that is used to analyse structural relationships. This technique is the combination of factor analysis and multiple regression analysis and is used to analyse the structural relationship between the measured variables and latent constructs (Byrne, B. M., 2001).

There is a need to check for multicollinearity issues before going ahead for testing the hypothesis. Multicollinearity occurs when the model includes multiple factors that are correlated not just to the response variable, but also to each other. In other words, it results when there are factors that are a bit redundant(Costello & Osborne, 2005).

Multicollinearity increases the standard errors of the coefficients. Increased standard errors in turn mean that coefficients for some independent variables may be found not to be significantly different from 0. In other words, by overinflating the standard errors, multicollinearity makes some variables statistically insignificant when they should be significant. Without multicollinearity (and thus, with lower standard errors), those coefficients might be significant.

One way to measure multicollinearity is the variance inflation factor (VIF), which assesses how much the variance of an estimated regression coefficient increases if the predictors are correlated. If no factors are correlated, the VIFs will all be 1. The general rule of thumb is that VIFs exceeding 4 warrant further investigation, while VIFs exceeding 10 are signs of serious multicollinearity requiring correction(Schumacker & Lomax, 2010).

The multicollinearity for our model is checked and found no issues of it as can be seen in table 6.26 by checking the VIF values.

Table 6.26: VIF VALUES

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	cohesion	.551	1.784
	communication	.575	1.740
	diversity	.873	1.146
	teammemchar	.560	1.786
	conflict	.423	2.366
	orgcul	.251	3.680
a. Dependent Variable: trust			

Hypothesis Testing:

i) Checking Direct Effects without Mediator: The initial structural model is drawn as shown in figure 6.22. The control variables are added and made to covary with all independent variables.

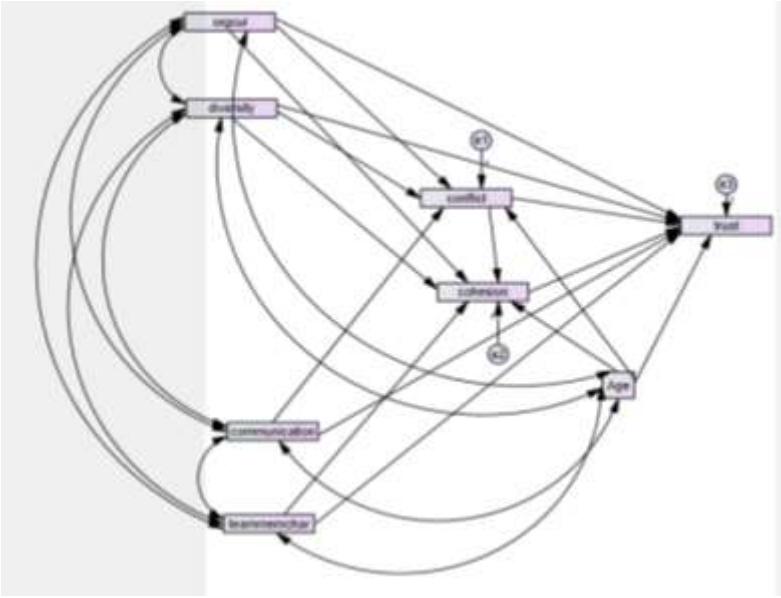


Figure 6.22: Initial structural model

In order to check for direct effects, the mediators are removed as shown in figure 6.23 and then checked for standard regression weights and squared multiple correlations as shown in table 6.27 to table 6.29.

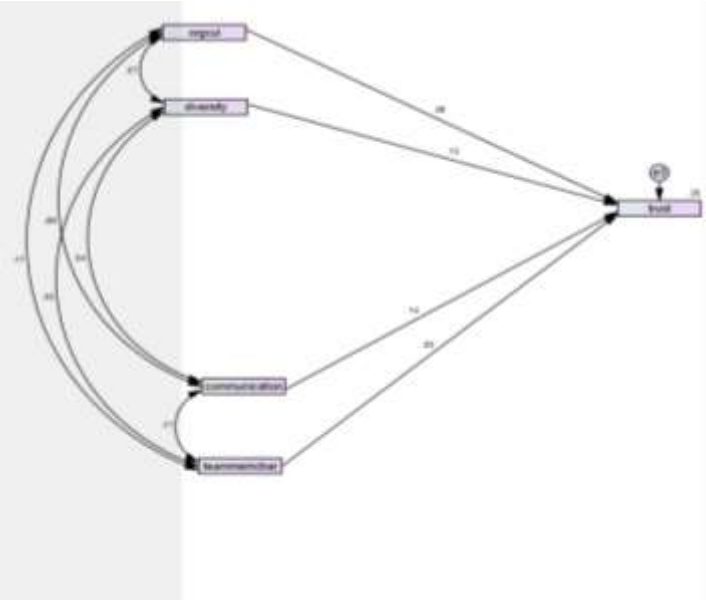


Figure 6.23: Structural model without mediators

Table 6.27: Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
trust	<---	orgcul	.393	.065	6.019	***	
trust	<---	diversity	.063	.023	2.754	.006	
trust	<---	communication	.121	.052	2.325	.020	
trust	<---	teammemchar	.142	.030	4.670	***	

This table can be analysed as follows:

a) The probability of getting a critical ratio as large as 6.019 in absolute value is less than 0.001. In other words, the regression weight for **orgcul** in the prediction of **trust** is significantly different from zero at the 0.001 level (two-tailed).

b) The probability of getting a critical ratio as large as 2.754 in absolute value is .006. In other words, the regression weight for **diversity** in the prediction of **trust** is significantly different from zero at the 0.01 level (two-tailed).

c) The probability of getting a critical ratio as large as 2.325 in absolute value is 0.020. In other words, the regression weight for **communication** in the prediction of **trust** is significantly different from zero at the 0.05 level (two-tailed).

d) The probability of getting a critical ratio as large as 4.67 in absolute value is less than 0.001. In other words, the regression weight for **teammemchar** in the prediction of **trust** is significantly different from zero at the 0.001 level (two-tailed).

Table 6.28: Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
trust	<---	Orgcul	.36
trust	<---	Diversity	.132
trust	<---	communication	.138
trust	<---	teammemchar	.23

This table can be analysed as follows:

a) When **orgcul** goes up by 1 standard deviation, **trust** goes up by 0.358 standard deviations.

b) When **diversity** goes up by 1 standard deviation, **trust** goes up by 0.132 standard deviations.

c) When **communication** goes up by 1 standard deviation, **trust** goes up by 0.138 standard deviations.

d) When **teammemchar** goes up by 1 standard deviation, **trust** goes up by 0.227 standard deviations.

Table 6.29: Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
trust	.35

This means that it is estimated that the predictors of **trust** explain 34.5 percent of its variance. In other words, the error variance of **trust** is approximately 65.5 percent of the variance of **trust** itself.

Therefore, we got the results of our hypothesis for direct effect as shown in table 6.30

Table 6.30: Results of direct effects

Hypothesis Number	Statement of Hypothesis	Results
H1	*A positive relationship exists between organizational culture and trust in virtual project teams.*	*Supported*
H4	*A negative relationship exists between diversity of team members and trust in virtual project teams.*	*Not supported; came out to be positive relationship*
H7	*A positive relationship exists between communication of team members and trust in virtual project teams.*	*Supported*
H9	*A positive relationship exists between characteristics of team member on trust in virtual project teams.*	*Supported*
H12	*A positive relationship exists between leadership skills of the manager and trust in virtual project teams.*	*Not supported, no effect*
H13	*A positive relationship exists between task-technology fit on trust in virtual project teams.*	*Not supported, not required*

ii) Checking mediator effects with multiple mediators by using Sobel test:

In order for a hypothesis to be supported, many criteria must be met. These criteria can be classified as global or local tests. In order for a hypothesis to be supported, the local test must be met, but in order for a local test to have meaning, all global tests must be met. Global tests of model fit are the first necessity. If a hypothesized relationship has a significant p-value, but the model has poor fit, we cannot have confidence in that p-value. Next is the global test of variance explained or R-squared. We might observe significant p-values and good model fit, but if R-square is only 0.025, then the relationships we are testing are not very meaningful because they do not explain sufficient variance in the dependent variable (Hayes & Andrew. F., 2013)

The model fit is achieved after adding controls. Next the R-squared values of dependent variables are checked as shown in Table 6.31. The R-squared values are good to go. Therefore two global tests- model fit and R-Squared are passed.

Table 6.31: Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
conflict	.172
Cohesion	.847
Trust	.532

There are many ways of doing mediation. Baron and Karon approach is dead, therefore sobel test is followed. In case of two mediators connected to independent variable, the sobel test is used because independent variable has multiple indirect paths to dependent variables. This means that the estimate calculated includes both the indirect paths. So the p-value for either indirect paths cannot be determined individually.

First of all, the direct effect of independent variable on dependent variable is significant. When the mediator variable M enters the model, the direct effect would be reduced since some of the effect has shifted through the mediator. If it is reduced but still significant, the mediation effect here is called "partial mediation". However, if the direct effect is reduced and no longer significant, then the mediation is called "complete mediation".

When analyzing the mediator, there are two effects involved namely **direct effect** and **indirect effect**. The direct effect is the effect from independent variable directly to dependent variable, while the indirect effect is the effect from independent variable to dependent variable that goes indirectly through the mediating variable. The significance of indirect effects indicates the mediation exists and the significance or insignificance of direct effects indicates the type of mediation (Zainudin, 2012). For indirect effects, bootstrapping is always required.

H2: ***Conflict mediates the positive effect of organizational culture on trust.***

As organizational culture has two mediating variables, in order to verify these hypothesis individually, we have to first remove the path from organizational culture to cohesion and calculate the data for this hypothesis as this independent variable has multiple indirect paths to the dependent variable. This means that the estimate calculated includes both indirect paths and it's not possible to determine the p- values for either indirect path individually.

The direct effect of organizational culture to trust has been calculated without mediator in table 6.28. Now the direct effect of organizational culture to conflict and then from

conflict to trust is calculated and is shown in table 6.32. Also, the indirect effect of organizational culture to trust via conflict through bootstrapping is shown in table 6.32.

Table 6.32: Standardized Indirect and Direct Effects (Org. Cult to trust with conflict as mediator)

	Standardized Indirect Effects (Group number 1 - Default model)							
	Avgsize	Age	teammemchar	communication	diversity	orgcul	conflict	cohesion
trust	-.002	.069	.182	-.037	-.003	**.243**	.308	.000
	Standardized Indirect Effects - Two Tailed Significance (BC) (p-value)							
trust	.888	.019	.001	.298	.960	**.001**	.001	...
	Standardized Direct Effects (Group number 1 - Default model)							
trust	-.017	-.011	.050	.170	.154	**-.104**	.235	.485
	Standardized Direct Effects - Two Tailed Significance (BC) (p-value)							
trust	.613	.764	.371	.004	.001	**.202**	.001	.001

Table 6.33: Summary of Indirect and Direct effects (Org. Cult to trust with conflict as mediator)

	Indirect Effect	Direct Effect
Bootstrapping Results	.243	-.104 (.358)
Bootstrapping P-value	.001	.202
Result	Significant	Non – Significant

The results in table 6.33 shows that indirect effect is significant at 99.9% confidence level. The significance of this indirect effect says that mediation is there. From the table 6.33, we can see that the direct effect is reduced to - 0.104 from 0.358 and is non-significant. The mediation is full as the direct effect got reduced and is non-significant, and hence hypothesis H2 is supported.

H3: Cohesion increases the positive effect of organizational culture on trust.

As organizational culture has two mediating variables, in order to verify these hypothesis individually, we have to first remove the path from organizational culture to conflict and calculate the data for this hypothesis as this independent variable has multiple indirect paths to the dependent variable. This means that the estimate calculated includes both indirect paths and it's not possible to determine the p- values for either indirect path individually.

The direct effect of organizational culture to trust has been calculated without mediator in table 6.28. Now the direct effect of organizational culture to cohesion and then from cohesion to trust is calculated and is shown in table 6.34. Also, the indirect effect of organizational culture to trust via cohesion through bootstrapping is shown in table 6.34.

Table 6.34: Standardized Indirect and Direct Effects (Org. Cult to trust with cohesion as mediator)

	Standardized Indirect Effects (Group number 1 - Default model)							
	Avgsize	Age	teammemchar	communication	diversity	orgcul	conflict	cohesion
trust	-.015	.062	.152	.098	.000	**.275**	.208	.000
	Standardized Indirect Effects - Two Tailed Significance (BC) (p-value)							
trust	.123	.033	.001	.001	.991	**.001**	.001	...
	Standardized Direct Effects (Group number 1 - Default model)							
trust	-.017	-.012	.050	.173	.156	**-.106**	.239	.464
	Standardized Direct Effects - Two Tailed Significance (BC) (p-value)							
trust	.615	.766	.372	.004	.001	**.202**	.001	.001

Table 6.35: Summary of Indirect and Direct effects (Org. Cult to trust with cohesion as mediator)

	Indirect Effect	Direct Effect
Bootstrapping Results	.275	-.106(.358)
Bootstrapping P-value	.001	.202
Result	Significant	Non - Significant

The results in table 6.35 shows that indirect effect is significant at 99.9% confidence level. The significance of this indirect effect says that mediation is there. From the table 6.35, we can see that the direct effect is reduced to - 0.106 from 0.358 and is non-significant. The mediation is full as the direct effect got reduced and is non-significant, and hence hypothesis H3 is supported.

H5: Conflict mediates the negative effect of diversity on trust in virtual project teams.

As Diversity has two mediating variables, in order to verify these hypothesis individually, we have to first remove the path from Diversity to cohesion and calculate the data for this hypothesis as this independent variable has multiple indirect paths to the dependent variable. This means that the estimate calculated includes both indirect paths and it's not possible to determine the p- values for either indirect path individually.

The direct effect of Diversity to trust has been calculated without mediator in table 6.28. Now the direct effect of Diversity to conflict and then from conflict to trust is calculated and is shown in table 6.36. Also, the indirect effect Diversity to trust via conflict through bootstrapping is shown in table 6.36.

Table 6.36: Standardized Indirect and Direct Effects (Diversity to trust with conflict as mediator)

	Standardized Indirect Effects (Group number 1 - Default model)							
	Avgsize	Age	teamm emchar	commu nication	diversity	orgcul	conf lict	cohes ion
trust	-.014	.039	.157	-.030	**-.032**	.467	.201	.000
	Standardized Indirect Effects - Two Tailed Significance (BC) (p-value)							
trust	.148	.141	.001	.298	**.118**	.001	.001	...
	Standardized Direct Effects (Group number 1 - Default model)							
trust	-.017	-.011	.049	.170	**.154**	-.104	.234	.487
	Standardized Direct Effects - Two Tailed Significance (BC) (p-value)							
trust	.613	.766	.376	.004	**.002**	.201	.001	.001

Table 6.37: Summary of Indirect and Direct effects (Diversity to trust with conflict as mediator)

	Indirect Effect	Direct Effect
Bootstrapping Results	-.032	.154 (0.132)
Bootstrapping P-value	.118	.002
Result	Non- Significant	Significant

The results in table 6.37 shows that indirect effect is non-significant. Therefore there is no mediation of conflict as mediator from diversity to trust, and hence hypothesis H5 is not supported.

H6: Cohesion mediates the negative effect of diversity on trust in virtual project teams.

As Diversity has two mediating variables, in order to verify these hypothesis individually, we have to first remove the path from Diversity to conflict and calculate the data for this hypothesis as this independent variable has multiple indirect paths to the dependent variable. This means that the estimate calculated includes both indirect paths and it's not possible to determine the p- values for either indirect path individually.

The direct effect of Diversity to trust has been calculated without mediator in table 6.28. Now the direct effect of Diversity to cohesion and then from cohesion to trust is calculated and is shown in table 6.38. Also, the indirect effect Diversity to trust via cohesion through bootstrapping is shown in table 6.38.

Table 6.38: Standardized Indirect and Direct Effects (Diversity to trust with cohesion as mediator)

	Standardized Indirect Effects (Group number 1 - Default model)							
	Avgsize	Age	teammemchar	communication	diversity	orgcul	conflict	cohesion
trust	-.014	.042	.148	-.029	**.022**	.459	.201	.000
	Standardized Indirect Effects - Two Tailed Significance (BC) (p-value)							
trust	.122	.109	.001	.298	**.025**	.001	.001	...
	Standardized Direct Effects (Group number 1 - Default model)							
trust	-.017	-.011	.049	.168	**.122**	-.103	.232	.484
	Standardized Direct Effects - Two Tailed Significance (BC) (p-value)							
trust	.617	.766	.378	.004	**.002**	.204	.001	.001

Table 6.39: Summary of Indirect and Direct effects (Diversity to trust with cohesion as mediator)

	Indirect Effect	Direct Effect
Bootstrapping Results	**.022**	**.122** (0.132)
Bootstrapping P-value	**.025**	**0.002**
Result	Significant	Significant

The results in table 6.39 shows that indirect effect is significant. The significance of this indirect effect says that mediation is there. From the table 6.39, we can see that the direct effect is reduced to 0.122 from 0.132 and is significant. The mediation is partial as the direct effect got reduced and is significant. And now for partial mediation, we need to check that absolute value of (div -> cohesion) X (cohesion->trust) > absolute value of (diversity ->trust) that is .046 X .484 = 0.022264 which is not greater than 0.122, and hence hypothesis H6 is supported and has partial mediation.

H8: ***Conflict mediates the positive effect of communication on trust in -virtual project teams***

The direct effect of Communication to trust has been calculated without mediator in table 6.28. Now the direct effect of Communication to conflict and then from conflict to trust is calculated and is shown in table 6.40. Also, the indirect effect Communication to trust via cohesion through bootstrapping is shown in table 6.40.

Table 6.40: Standardized Indirect and Direct Effects (Communication to trust with conflict as mediator)

	Standardized Indirect Effects (Group number 1 - Default model)							
	Avgsize	Age	teamm emchar	commu nication	diversity	orgcul	conf lict	cohes ion
trust	-.014	.040	.149	**-.030**	-.010	.465	.203	.000
	Standardized Indirect Effects - Two Tailed Significance (BC) (p-value)							
trust	.123	.129	.001	**.298**	.670	.001	.001	...
	Standardized Direct Effects (Group number 1 - Default model)							
trust	-.017	-.011	.049	**.169**	.153	-.104	.234	.485
	Standardized Direct Effects - Two Tailed Significance (BC) (p-value)							
trust	.615	.766	.376	**.004**	.002	.201	.001	.001

Table 6.41: Summary of Indirect and Direct effects (Communication to trust with conflict as mediator)

	Indirect Effect	Direct Effect
Bootstrapping Results	-.030	.169(0.138)
Bootstrapping P-value	.298	.004
Result	Non-significant	Significant

The results in table 6.41 shows that indirect effect is non-significant. Therefore there is no mediation of conflict as mediator from communication to trust, and hence hypothesis H8 is not supported.

H10: ***Cohesion increases the positive effect of team member characteristics on trust.***

The direct effect of team member characteristics to trust has been calculated without mediator in table 6.28. Now the direct effect of team member characteristics to cohesion and then from cohesion to trust is calculated and is shown in table 6.42. Also, the indirect

effect team member characteristics to trust via cohesion through bootstrapping is shown in table 6.42.

Table 6.42: Standardized Indirect and Direct Effects (Team member Characteristics to trust with cohesion as mediator)

	Standardized Indirect Effects (Group number 1 - Default model)							
	Avgsize	Age	teamm emchar	commu nication	diversity	orgcul	conf lict	cohes ion
trust	-.014	.040	**.149**	-.030	-.010	.465	.203	.000
	Standardized Indirect Effects - Two Tailed Significance (BC) (p-value)							
trust	.123	.129	**.001**	.298	.670	.001	.001	...
	Standardized Direct Effects (Group number 1 - Default model)							
trust	-.017	-.011	**.049**	.169	.153	-.104	.234	.485
	Standardized Direct Effects - Two Tailed Significance (BC) (p-value)							
trust	.615	.766	**.376**	.004	.002	.201	.001	.001

Table 6.43: Summary of Indirect and Direct effects (Team member Characteristics to trust with cohesion as mediator)

	Indirect Effect	Direct Effect
Bootstrapping Results	0.149	.049 (0.227)
Bootstrapping P-value	0.001	.376
Result	Significant	Non – Significant

The results in table 6.43 shows that indirect effect is significant at 99.9% confidence level. The significance of this indirect effect says that mediation is there. From the table 6.43, we can see that the direct effect is reduced to 0.049 from 0.227 and is non-significant. The mediation is full as the direct effect got reduced and is non-significant, and hence hypothesis H10 is supported.

The researcher got the results of hypothesis after getting model fit, significant R-Squared, p- value and direction of indirect effect as shown in table 6.44.

Table 6.44: Mediation effects

Hypothesis Number	Statement of Hypothesis	Results
H2	*Conflict mediates the positive effect of organizational culture on trust.*	*Supported- full mediation*
H3	*Cohesion increases the positive effect of organizational culture on trust.*	*Supported- full mediation*
H5	*Conflict mediates the negative effect of diversity on trust in virtual project teams.*	*Not supported, no mediation*
H6	*Cohesion mediates the negative effect of diversity on trust in virtual project teams.*	*Supported , Partial Mediation*
H8	*Conflict mediates the positive effect of communication on trust in -virtual project teams.*	*Not supported, no mediation*
H10	*Cohesion increases the positive effect of team member characteristics on trust.*	*Supported, full mediation*

iii) Checking Moderator effects (interactions)

H14: Experience in virtual project team will moderate the relationship between diversity and conflict in virtual project teams in that the relationship is weaker for individuals with high levels of experience. ---**SUPPORTED**

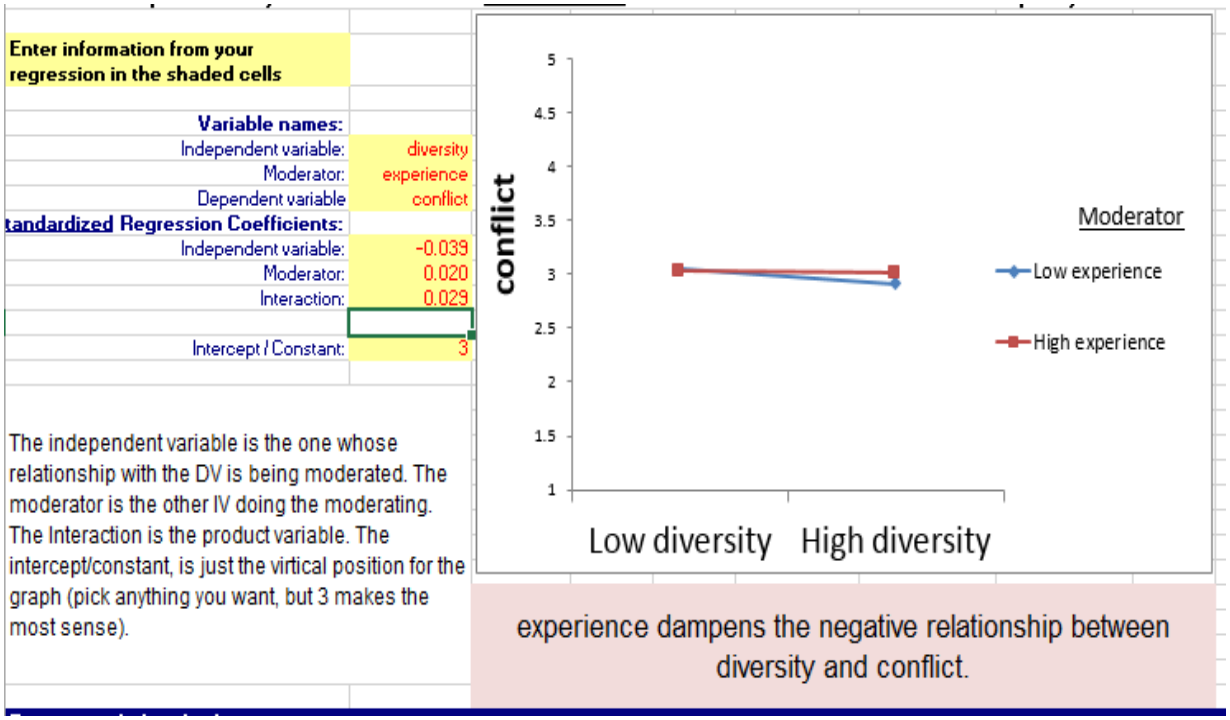


Figure 6.24: Moderation Effect 1

The hypothesis H5: Conflict mediates the negative effect of diversity on trust is not supported as mentioned in previous section. And from figure 6.24, it is also concluded that experience not only dampens the negative relationship between diversity and conflict but also conflict brings in positive effect of diversity on trust building.

H15: Experience in virtual project team will moderate the relationship between diversity and cohesion in virtual project teams in that the relationship is stronger for individuals with high levels of experience. ---**NOT SUPPORTED**

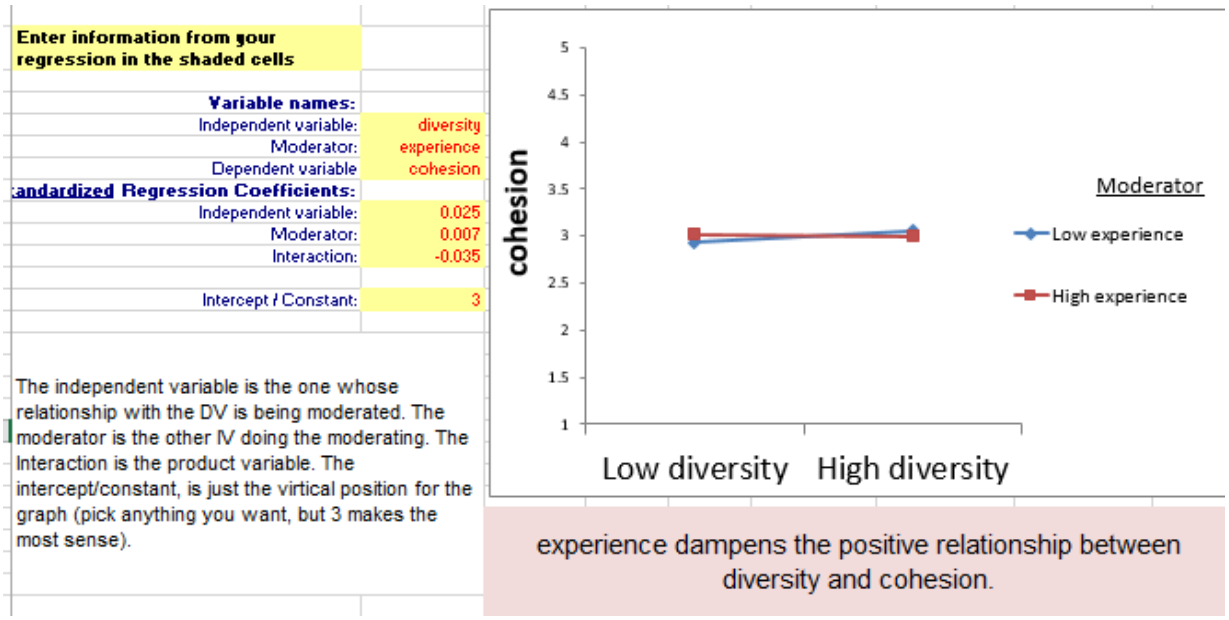


Figure 6.25 : Moderation Effect 2

When there is cohesion in the teams , low experience or high experience does not matter in the relationship between diversity and cohesion. It is also understood that it is not necessary that high experience people will bring more cohesion in the teams. Rather sometimes because of their high experience and different perceptions on a particular problem, sometimes high experienced people bring ego issues and results in interpersonal conflicts in the team.

H16: Experience in virtual project team will moderate the relationship between Communication and conflict in virtual project teams in that the relationship is weaker for individuals with high levels of experience. ---**SUPPORTED**

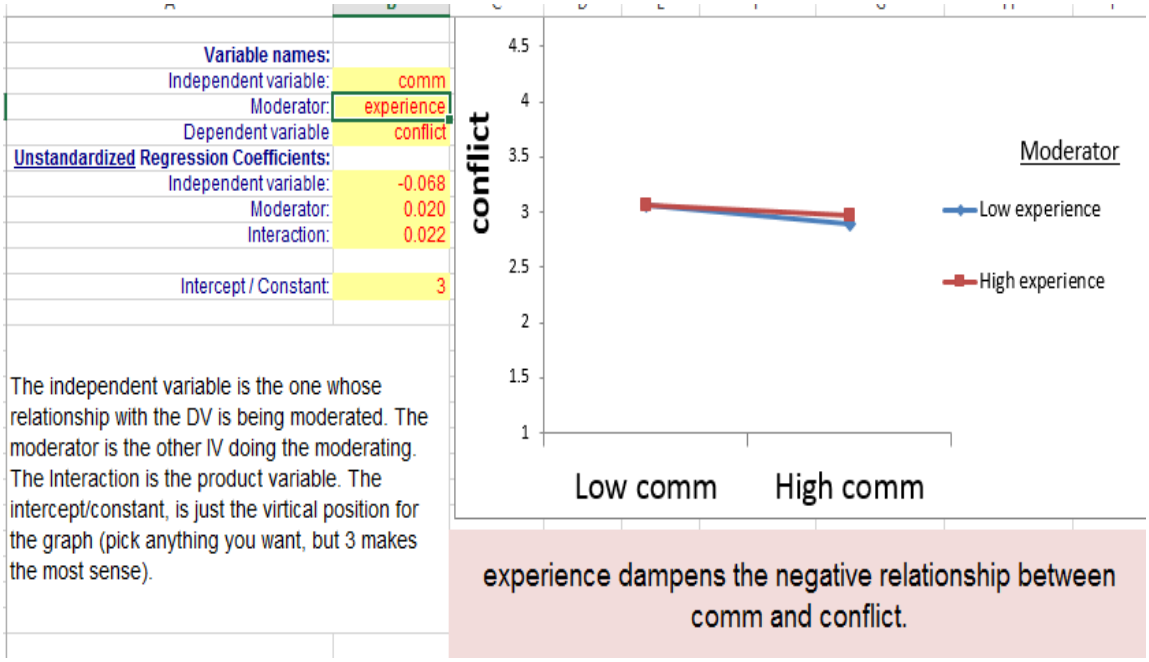


Figure 6.26 : Moderation Effect 3

The hypothesis H8: Conflict mediates the positive effect of communication on trust is not supported as mentioned in previous section. And from figure 6.26, it is also concluded experience dampens the negative relationship between communication and conflict because the high experienced team members reduces conflicts when right kind of communication is provided to the teams.

The final model of trust through Structural Equation Modeling is as shown in figure 6.27.

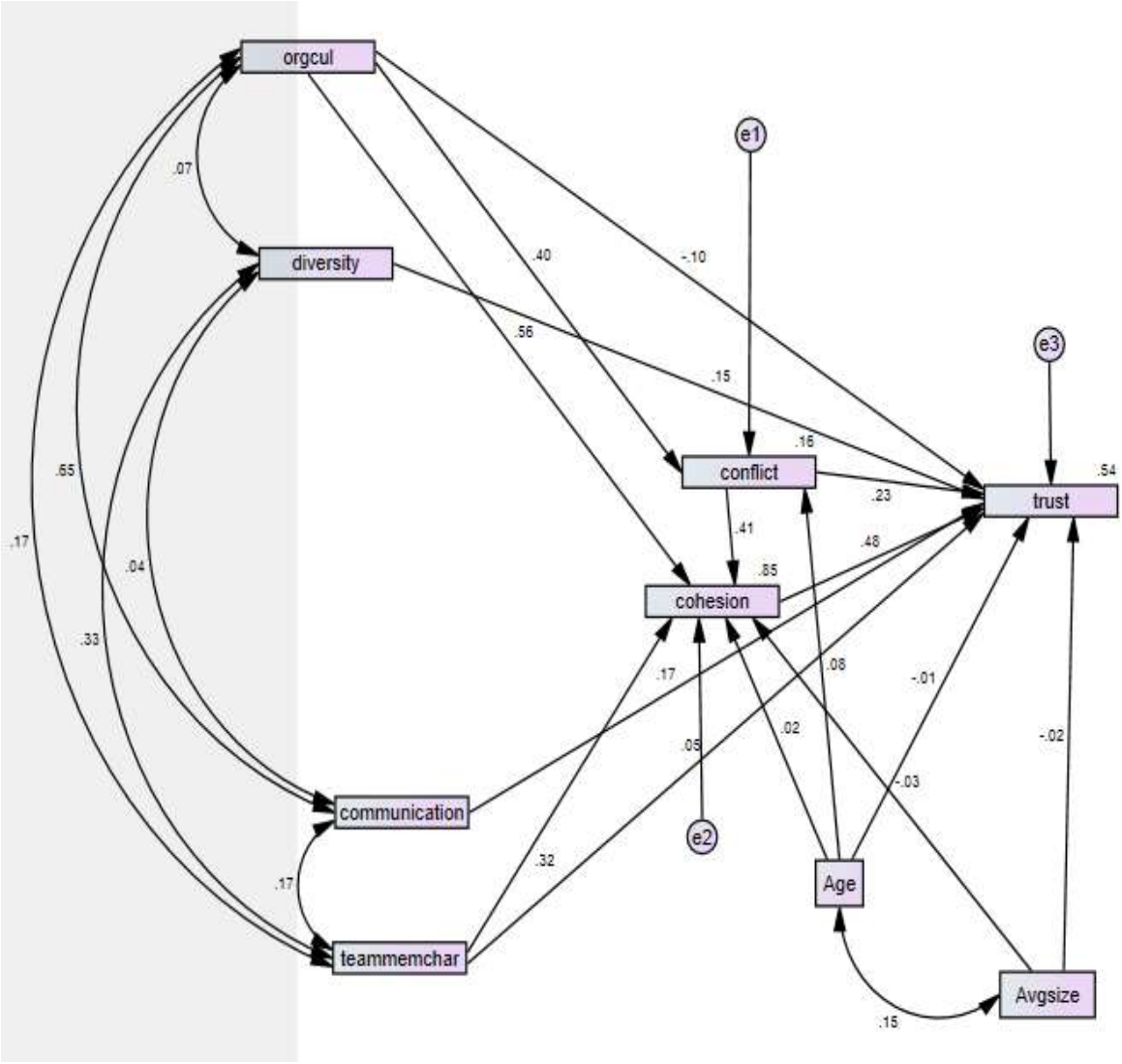


Figure 6.27 : Final SEM Model of Trust

The final summary of Hypothesis results are shown in Table 6.45.

Table 6.45: Summary of Hypotheses

Hypothesis Number	Statement of Hypothesis	Results
H1	*A positive relationship exists between organizational culture and trust in virtual project teams.*	*Supported*
H2	*Conflict increases the positive effect of organizational culture on trust.*	*Supported- full mediation*
H3	*Cohesion increases the positive effect of organizational culture on trust.*	*Supported- full mediation*
H4	*A negative relationship exists between diversity of team members and trust in virtual project teams.*	*Not supported; came out to be positive relationship*
H5	*Conflict increases the negative effect of diversity on trust in virtual project teams.*	*Not supported, no mediation*
H6	*Cohesion mediates the negative effect of diversity on trust in virtual project teams.*	*Supported , Partial Mediation*
H7	*A positive relationship exists between communication of team members and trust in virtual project teams.*	*Supported*
H8	*Conflict decreases the positive effect of communication on trust in -virtual project teams.*	*Not supported, no mediation*
H9	*A positive relationship exists between characteristics of team member on trust in virtual project teams.*	*Supported*
H10	*Cohesion increases the positive effect of team member characteristics on trust.*	*Supported, full mediation*
H11	*The more conflict among virtual team members, the less is the cohestion among them.*	*Supported*
H12	*A positive relationship exists between leadership skills of the manager and trust in virtual project teams.*	*Not supported, no effect*
H13	*A positive relationship exists between task- technology fit on trust in virtual project teams.*	*Not supported, not required*
H14	*Experience in virtual project team will moderate the relationship between diversity and conflict in virtual project teams in that the relationship is weaker for individuals with high levels of experience.*	*Supported*
H15	*Experience in virtual project team will moderate the relationship between diversity and cohesion in virtual project teams in that the relationship is stronger for individuals with high levels of experience.*	*Not supported*
H16	*Experience in virtual project team will moderate the relationship between communication and conflict in virtual project teams in that the relationship is weaker for individuals with high levels of experience.*	*Supported*

6.2.3.3 Discussion on Model of Trust

This research is about understanding the phenomenon of virtual project teams, operating in construction sector of the Middle East, with people coming from various cultural backgrounds and different countries to work on various kinds of projects. The main focus of research is on multi-disciplinary virtual project teams, to understand their performance factors. It has been found through comprehensive literature review that trusts among virtual team members play a crucial role in the performance of the team. The aim of this research is to understand various factors (drivers and barriers) of trust and to propose a model of trust to analyse the impact of these factors on trust within virtual project teams in construction sector in the context of the Middle East. This research would be beneficial to Project Managers of Architectural / Engineering / Construction Companies by helping them know the actions required for better team collaboration in virtual teams. This will lead to greater team performance and individual learning.

For this research, the online questionnaire was created and data for this questionnaire was collected from various industry experts. Based on the statistical analysis of data through IBM SPSS software and by using structural equation modelling (IBM AMOS Ver22), I have created a model of trust as shown in figure 6.28 which constitutes various factors affecting it either positively or negatively. The different factors which affect the trust within virtual project teams came out to be

a) Organizational culture of the company
b) Diversity of the team members.
c) Degree of communication within the team.
d) Team Members' characteristics
e) Conflict within the team
f) Cohesion of the team

It has been found that the following two factors do not affect the virtual teams in Middles East:

a) Leadership skills of the Superior
b) Task- Technology fit

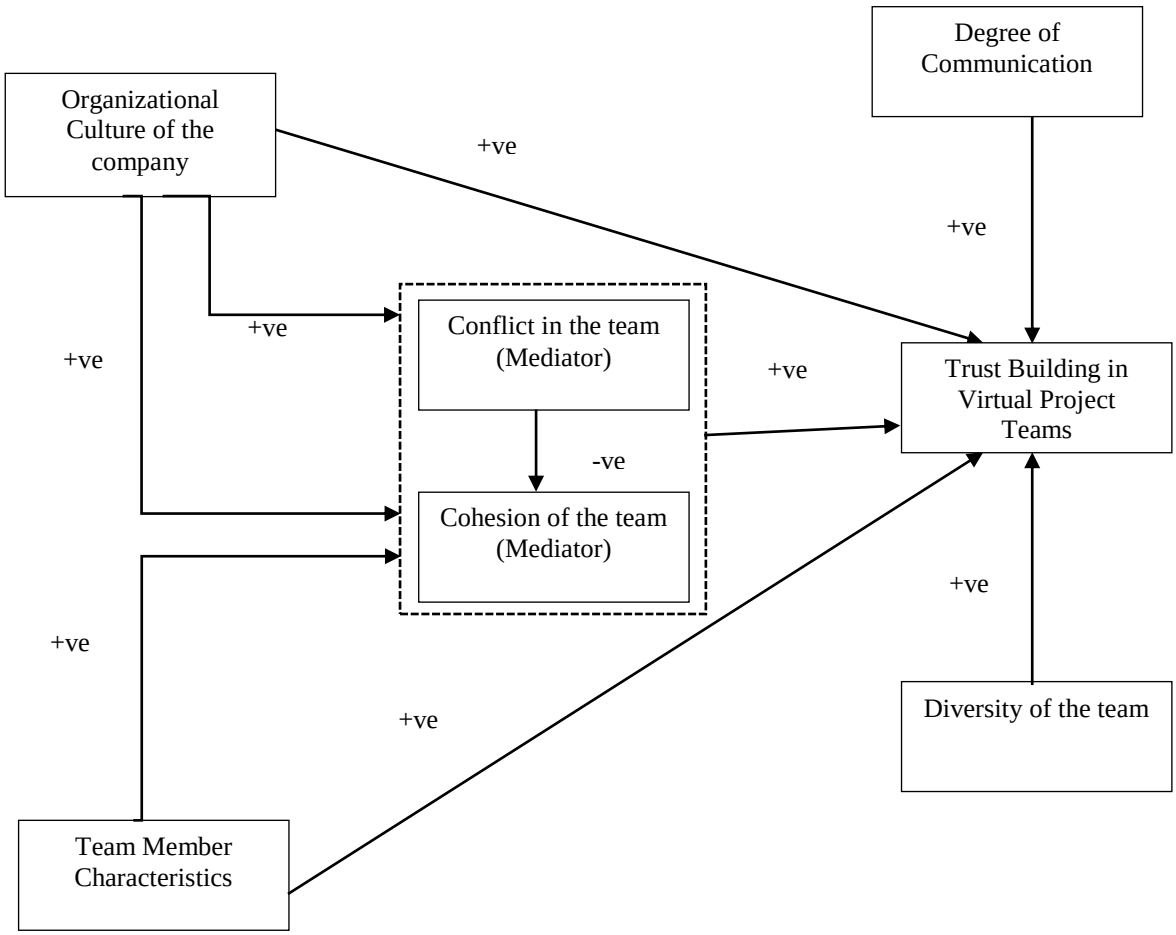


Figure 6.28: Model of Trust building in virtual project teams of Construction Sector

Through the statistical analysis of data, the different relationships between the variables are found. The discussion of these relationships is as follows:

H1: A positive relationship exists between organizational culture and trust in virtual project teams : Supported

The organizational culture of the the company consists of many elements such as clear objectives and goals, recruitment strategy, rewards of the team members, fair policy of team evaluation, mentoring of the team members and degree of task interdependence. According to literature study done in chapter 4, it has been found that when members are committed to the team objectives, especially long-term goals that bring about successes of whole of the team, they are persuaded to pursue team's ideals spontaneously (Gazor, 2012). Therefore to ensure trust among team members, it is very important to have clear understanding of team goals during the team planning process (Brahm & Kunze, 2012). Team selection is a key factor which

differentiates successful teams from unsuccessful ones. Amah, Nwuche, & Chukuigwe, (2013) believed that members of teams are first members of organizations before they become members of teams. The selection criteria an organization uses, therefore affects the type of people that will be in teams. Barkhi et al. (2004) examined rewarding teammembers based on individual decision outcomes or on team decision outcomes. They found that rewards greatly increase the trust of team members in the organization. The mechanism of fairness of outcomes, fairness of decision making procedures, fairness of interpersonal treatment and adequacy of information about decision making procedures and outcome distribution (Bryant et al., 2009) refers to the team evaluation.

From the statistical analysis of data, it has been shown that this hypothesis got supported and so do from literature too. This is primarily because the clear understanding of objectives and processes by the team members brings success in the execution of the tasks by them. The selection criteria an organization uses, affects the type of people that will be in team, which greatly affects the coordination among team members. Furthermore, the fair evaluation of the team and the reward structure of the organization increase the trust among the team members as they became confident that there is no biasing as far as the evaluation is concerned. The mentoring of the team members gave a sense of belonginess for the team as they get feedback on their activities from their superiors which helps them to build confidence in the management. As the operations in construction sector involve many tasks, there is strong interdependence among different tasks starting from bidding, procurement, design, engineering and execution, Therefore, the task interdependence brings lot of communication and coordination in the team which increases the trust. Hence, the existence of these elements for organizational culture affects positively in the building of trust.

H2: Conflict mediates the positive effect of organizational culture on trust: **Supported; full mediation**

H3: Cohesion increases the positive effect of organizational culture on trust: **Supported; full mediation**

Researchers propose that task, process, and relational conflict are consistently detrimental to the performance of distributed teams (Hinds & Bailey, 2003). Although not all conflict is "bad," conflict that undermines team performance and organizational outcomes requires effective management. The active management and earlier detection of conflict may be particularly crucial in virtual teams (Hinds & Mortensen, 2005). Relational conflict stems from a lack of understanding about the personal situations of other team members. Process conflict stems from a lack of agreement concerning how work should be done (Wakefield, Leidner, & Garrison, 2008)(Wakefield et al., 2008). Neither relational conflict nor process conflict are directly related to task goals per se, but rather to the individuals performing the task and their means of accomplishing the task. Therefore organizational culture gets affected by the type of conflict existing among the team members.

Cohesion is defined as the bonding among team members. The virtual teams not only face performance related issues but also more susceptible to atmospheric challenges such as the lack of team cohesion or trust (DeRosa et al., 2004). The cohesion of the team allows a joint cooperation to execute the common goals of the organization (Brahm & Kunze, 2012). But for virtual teams, it is often difficult to develop high team cohesion based on shared goals as they have less communication and interaction compared to real teams (Blackburn et al., 2003). If a high trust climate is created in the first stage of the virtual team development process, team goals should be better transferred in cohesive team because the uncertainty and ambiguity of the other team members' behaviour is reduced (Dirks & Ferrin, 2001). Thus, the team cohesion greatly facilitates the organizational culture of the company.

From the statistical analysis of data, it has been shown that both these hypothesis got supported and so do from literature too. If the bonding between the team members is strong, it brings the teams together towards accomplishment of organizational goals. This results in building of trust among them. Also the more team discusses the task oriented conflicts, the more they became positive towards commitment of organizational objectives. This increases the mutual trust among team members.

H4: ***A negative relationship exists between diversity of team members and trust in virtual project teams : Not Supported; came out to be positive realationship***

From the literature on virtual teams study, It has been found that the diverse nature of teams creates distrust in the teams. L. Peters & Karren, (2009) stated that diversity among team members can cause variations in their attitudes, values, and overall performance, giving rise to conflicts among the team members. It has been argued that there is a higher probability for a team member to trust similar others than dissimilar ones. Therefore, trust is more likely to emerge in homogeneous rather than in heterogeneous teams (Costa, 2003).

From the statistical analysis of data, it has been shown that this hypothesis did not get supported and was opposite of the literature discussed above. This is because, in the Middle East, the people from different cultures join the construction sector as virtual team members. From the literature review, it has been found that the diverse nature of virtual teams affects the trust of team negatively as trust is more likely to emerge in homogenous rather than in heterogenous teams. But after collecting data from various experts for this research, it has been found that the diversity actually increases the trust within the team as the teams benefit from the varied specilializations and experience of diversified members of the team.

H5: Conflict mediates the negative effect of diversity on trust in virtual project teams:Not Supported, No mediation

H6: Cohesion mediates the negative effect of diversity on trust in virtual project teams: Supported, Partial mediation

It has been found in literature that diversity has a positive impact on conflict and a negative impact on the emergence of trust. Team diversity increases the conflict within the teams and effects the trust negatively. It is also been found that the team members perceive team members more trustworthy that belong to same culture than the ones who belong to other cultures (Zolin *et al.*, 2004). A cohesive group is one in which the members are attracted to the group and to its task (Kozlowski & Bell, 2003). In the distributed team literature, cohesion has been linked to team effectiveness (Gonzalez et al., 2003), team satisfaction, and effective communication

(Chidambaram, 1996). Hence, diversity is likely to inhibit the interaction that is necessary for team members to be fully committed to the team and each other.

But in reality, through statistical analysis of data, it has been found that diversity does not increase in any kind of conflict, thus not affecting the building of trust. Also the cohesion among the diverse teams results in the positive building of trust as it brings the team members closer. In cultural diverse teams, if there is bonding between the team members, it is going to increase the positive effect of diversity on trust building.

H7: A positive relationship exists between communication of team members and trust in virtual project teams: Supported

The development of trust is linked to increased communication among members (Jarvenpaa, Shaw, & Staples, 2004). Amah et al., (2013) suggested that managers can send employee for training to acquire skills and experiences that will make them good team players. The training could allow employees to experience the satisfaction that teamwork can provide. The training could be in the form of workshop to help employees improve their problem solving, communication, negotiation, conflict management, and coaching skills.

From the statistical analysis of data, it has been shown that this hypothesis got supported and so do from literature too. The virtual teams are distributed at different locations. In order to work effectively, they are required to communicate. The effective use of communication, especially during the early stages of the team's development, plays an important role in gaining and maintaining trust. It has been found through statistical analysis of data that increase in communication among virtual team members leads to better trusting beliefs in teams.

H8: Conflict decreases the positive effect of communication on trust in virtual project teams: Not Supported., No mediation

In Literature, it has been found that the distributed teams exhibit weaker relational links among team members . This weaker relationships is due to the significant reliance on communication tools and technologies. There is also a misconception among dispersed team members as they often assume that co-located team members

are talking and sharing information that is not communicated to them. These private exchanges among co-located team members have been identified as the cause of friction between team members (Crampton, 2001; Sarker & Sahay, 2002) which results in conflicts among virtual team members. Thus, the very nature of the electronic exchanges within virtual teams may be a source of conflict; when the level of information richness is low because of a lean medium of communication.

From the statistical analysis of data, it has been shown that this hypothesis did not get supported and is opposite of the literature findings . In the context of the Middle East, It has been found through analysis that the conflict and cohesion within the team neither increase nor decreases the effect of commnication on trust in virtual project teams.

H9: A positive relationship exists between characteristics of team member on trust in virtual project teams: Supported

In some relationships, trust is only dependent on simple basic variables but as relationships mature and members get to know each other, individuals learn to trust or distrust the team members according to their characteristics (Kramer & Lewicki, 2010). The team member characteristics involves ability, integrity, benevolence and cognitive elements of team members. Kasper-Fuehrer & Ashkanasy (2001) stressed the importance of "business ethics"(integrity) in a virtual setting, while communicating trustworthiness. Greenberg et al. (2007) showed that trust is composed of three components: ability, integrity and benevolence. These components play important roles in different stages of establishment and operation of a virtual teams.

From the statistical analysis of data, it has been shown that this hypothesis got supported and so do from literature too. The team members in virtual teams are diverse in terms of their characteristics . The term member characteristics consists of ability, integrity , benevolence, competence, reliability and professionalism elements of team members. Through data analysis, it has been found that these team characteristics leads to have positive effect on trust in virtual team members.

H10: Cohesion increases the positive effect of team member characteristics on trust: Supported, Full Mediation

Kanawattanachai & Yoo (2002) showed that trust relies more on cognitive components such as competence, reliability, professionalism than affective ones which includes care and emotional connection to each other. Nakayama et al. (2006) also stressed that trust is related to competence, loyalty and receptiveness.

From the statistical analysis of data, it has been shown that this hypothesis got supported and so do from literature too. Along with positive team member characteristics, the cohesion plays a great role in building the trust. If the team is closely knitted together, the positive effect of team member characteristics gets increased on trust.

H11: The more conflict among virtual team members, the less is the cohestion among them: Supported

Dafoulas & Macaulay (2012) have stated that a high level of trust is required in order for virtual teams to perform effectively and avoid any delays and conflicts, which is much higher than in traditional collocated teams. In a team, the members contribute to the team through social and task inputs. Relationship conflict exists when there are interpersonal incompatibilities among group members. This includes tension, animosity, and annoyance among group members (Jehn, 1995) and leads to decrease in cohesion of the team. In highly interdependent groups, relationship conflict is expected to have a stronger negative effect on the emergence of trust.

From the statistical analysis of data, it has been shown that this hypothesis got supported and so do from literature too. Conflict is defined as perceived incompatibilities or disagreements among team members. It has been found that as the conflict among team members increase, the cohesion among team members decreases which effects the trust among team members. Poor managed conflicts results in damaged relationships, limit learning of the teams and results in distrust among the team members. Therefore, there is inverse relationship between conflict and cohesion.

H12: A positive relationship exists between leadership skills of the manager and trust in virtual project teams: Not Supported; no effect

In the literature, it has been found that in a virtual work setting, where employees are working in different locations than their managers, the opportunity for face-to-face contact is limited. This means that the manager has significantly fewer opportunities to view employee behavior than would exist in a conventional work setting. This leads to frustrations among team members because there is neither motivation nor any feedback from superior. Chutnik & Grzesik, (2009) emphasised that the leader should create an atmosphere of team learning especially during the process of team building . Therfore, it becomes more important for team leaders to motivate team members in these "high-intensity conditions" to "commit strongly to the overall team effort" (Kerber & Buono, 2004; Horowitz et al., 2007; Malhotra et al., 2007).

From the statistical analysis of data, it has been shown that this hypothesis did not get supported and is opposiye from too. But in context of the Middle East , it has been found that leadership skills of manager doesnot matter in building trust among team members.

H13: A positive relationship exists between task- technology fit on trust in virtual project teams: Not Supported; not required

The choice of the communication technology is dictated by the nature of tasks the team is performing as well as depend on the organization's resources (Bell & Kozlowski, 2002). Less complex tasks often require minimal communication and collaboration between team members. In these situations, asynchronous communication media, such as e-mail or screensharing, will usually be sufficient because the need for reciprocal communication and interdependence is minimal . However, if a task is very complex and requires a great deal of information exchange and group decision-making, e-mail will not provide an effective means of communication between team members and a process loss will result.

From the statistical analysis of data, it has been shown that this hypothesis did not get supported and is opposite of the literature findings . The nature of tasks in construction sector varies from simple to complex. Often, the varied nature of tasks

require various technologies. The more complex tasks required great deal of information exchange and group decision- making, email will not be effective for such tasks. But the data analysis results says that the task- technology fit is not required for building of the trust among virtual project teams in the context of Middle East.

H14: Experience in virtual project team will moderate the relationship between diversity and conflict in virtual project teams in that the relationship is weaker for individuals with high levels of experience :Supported
H15: Experience in virtual project team will moderate the relationship between diversity and cohesion in virtual project teams in that the relationship is stronger for individuals with high levels of experience : Not Supported
H16: Experience in virtual project team will moderate the relationship between Communication and conflict in virtual project teams in that the relationship is weaker for individuals with high levels of experience: Supported

Experience is used as moderator variable. The experience in virtual project teams does not only refers to the number of years in the virtual project teams but it also relates to the number of projects done by individuals. It is important, because the longer the team has been in existence, the longer its members have interacted and had time to develop harmonious relationships. This results in reducing the conflict even though team members are from diverse sections of society. Moreover, increase in experience in virtual teams makes individual more mature and it helps in building cohesion. Since senior members normally have many domain experiences and were often assigned with the responsibilities pertaining to teamwork (Hwang, 2012; McMillan & Ledder, 2001; Reilly et al.; Vaccaro et al., 2012), they are more likely to provide accurate, reliable and objective data.

Experience team members are able to carry out interdependent tasks that lead to the completion of an entire piece of work(Amah et al., 2013b). As the virtual project teams are made up of heterogeneous team members, these kind of teams experience more conflicts and take longer time to develop although they are more effective at solving complex problems requiring innovative solutions. The competences are also

developed through experience (Chutnik & Grzesik, 2009). Therefore, to get the best set of skills it is recommended to lead or work in as many virtual teams as possible, and to work on a number of cross-cultural teams. This leads to greater cohesion even though the teams are diverse in nature. Continues improvement procedures in terms of degree of communication provide a baseline for maximizing the benefits from experienced team members on one project to another one (Azimi, 2011). Also shared experiences and goals are the fastest ways to build establishing a relationship of mutual understanding or trust within a team.

The data analysis shows that the high experienced team members' help in resolving task based conflicts among the diverse teams. They also assist in reducing conflicts arising from communication errors or misunderstanding.

6.3 Implications of Model of Trust derived from Structural Equation Modelling

The model of Trust generated from Structure Equation Modelling suggested the following guidelines in the context of the Middle East

1. The degree of communication among the virtual project teams positively influence the building of trust. The tools and type of communication, trainings to handle conflicts and on interpersonal skills, improving the problem solving approach improves the communication among virtual project teams. These are highly recommended because mutual understanding within the team diminishes and overall understanding is hampered when communication among team members is not strong.
2. In context of Middle East, the analysis of data resulted that diversity of team members actually increases the trust among the members. This is primarily because the diverse members bring in lot of expertise and alternate solutions for managing the tasks of the projects.
3. The organizational culture of the company improves the trust among the team members when the members are given a clear picture of their objectives and are being told of what is expected from them. The ambiguity in the rules, unfair policy of team evaluation and unstructured reward policies brings in lot of distrust among the team members. Hence, it's very important for the

management to follow a structured approach towards the organizational culture of the company.

4. The recruitment strategy of the organization needs to be in place when recruiting team members for the virtual projects. This is highly crucial because if the right kinds of people are not recruited for the projects, it results in lot of arguments and tensions in the teams. Therefore the members should have the characteristics of ability, professionalism, dedication, integrity and benevolence. The more competent team members bring in lot of satisfaction, motivation and trust among the team members.
5. As the team members are functionally and culturally different, there tends to be some conflict among the team members. The relationship conflicts relates to the ego problems and leads to distrust among the team members whereas the task based conflicts relates to the positivity in the teams. This is primarily because the task based conflicts leads to healthy discussions in the teams for finding the alternate solutions for the problems. The only care the teams need to take is to have control on the frequency of occurrence of these conflicts.
6. Owing to the right kind of people in the teams and functionally diversified teams, the members' starts believing each other's capabilities and builds strong bonding among the members. This cohesion results into the sharing of knowledge which results in building up of trust and results in faster execution of projects.
7. Last but not the least, it is understood from the data that there needs to have experienced people in the teams. The high experience of the members results in less conflicts, more exchange of information and results in better communication within the team.

6.4 Summary

The chapter borrows vital conceptions from its predecessor chapters – Chapter 4: Virtual Project Teams' Trust Indicators and Construction of Research Hypothesis and Chapter 5: Research Methodology. It depicts the results of the preliminary statistical findings using software IBM SPSS. The Structural Equation Modeling using IBM AMOS was discussed and specification, identification and validation of Measurement and Structural models for trust were done through AMOS software. Thereafter the

final model of trust was discussed with emphasis on the results of each hypothesis. In the last section, the guidelines for the project managers are suggested for building up of trust in the virtual project teams.

In the next chapter, the results of Structural Equation Modelling for model of trust were validated using semi- structured interviews with Industry experts. The industry experts were interviewed as they were having varied experience in virtual project teams in the Middle East. It was an attempt to understand the reasoning behind getting the unique results with respect to trust building in virtual team members of construction sector in Middle East.

Chapter 7
Validation of Proposed Model of Trust

7.1: Introduction

The literature reviewed in Chapter 2 and 3 showed that trust is one of the main component for the successful implementation of virtual project teams in Construction Sector. The chapter 3 highlighted the existing models of trust and performance though not in context of Middle East, but these models gave insights for the challenges faced by virtual team members in building trust among the team members. The chapter 4 highlighted the indicators and theoretical model of trust based on extensive literature review. Further, the construction of hypothesis was done. The research methodology discussed in chapter 5 influenced the research design for the empirical part. The data collected is analysed in chapter 6 using IBM SPSS and structural equation modelling using AMOSv22. This resulted in testing of hypothesis and resulted in model of Trust.

This chapter concentrates on the validation of the results achieved in chapter 6. It is divided into four sections. Section 7.2 details the interviewee selection criteria, their profiles and the process of conducting the interviews. Section 7.3 explains the method of qualitative analysis. The interpretation of interview results is discussed in section 7.4 around the nine themes of trust. Section 7.5 summarises this chapter.

7.2: Interview details

As described in chapter 6, Judgemental Sampling was used in validating the model of the trust. This sampling is a non- probability based sampling technique. Judgemental sampling design is usually used when a limited number of individuals possess the trait of interest. It is the only viable sampling technique in obtaining information from a very specific group of people. In this research, the respondents are expected to be graduates working in construction sector of the Middle East, therefore this sampling technique were used.

In depth face-to-face interviews were conducted with 10 professionals, out of which 6 were team members of virtual project teams and 4 were team leaders of virtual project teams of construction sector in Middle East. There were 2 female participants among all of them. The interviewee's had varied range of experience in the construction industries of Middle East, Holland, UK, India, Japan and Korea. The

participants for interview worked in fields of Projects- Construction and Engineering, Bids and Proposals, Project Estimations, Consultancy, EPC etc.

All the ten interviews were conducted face-to-face and each lasted for approximately 2 hours at the interviewee's place of work. The interviews were audio recorded, at the interviewee's consent, then transcribed and coded. The contacts for these interviewees were obtained from The Emirates Oil and Gas directory, Middle East Building and Construction Directory and The Blue Book Building.

A research information sheet with interview questions was sent to the potential candidates for interview. After their agreement to participate in the study, the date and place of interview were agreed according to the interviewee's preferences. On the interview date, the interviewee was given a reminder about the research purpose. Then the consent form was introduced to the interviewee. It explained about the confidentiality of the data and the assurance of anonymity of the participant's identity. The participants were asked to sign the consent form. The interview began with the introduction of the interviewee with general questions such as job role and responsibilities, years of experience, nature of work and size of company. This information helped to break the ice between the interviewee and interviewer. A detailed description of the interviewees' profiles is presented in table 7.1 below.

Table 7.1: Information about participants meetings

S.no.	**ID**	**Type of Experience**	**Job Title**	**Years of Experience**
1.	**AS**	Bids and Proposals, Project Estimation	Project Manager	22 years
2.	**VI**	Construction, Consultancy	Team Member	13 years
3.	**PR**	Construction Engineering	Project Manager	11 years
4.	**SH**	Construction , EPC	Team Member	15 years
5.	**RL**	Projects- Construction and Engineering, Automobile Industry, Manufacturing Industry	Team Member	12 years
6.	**RA**	Consultancy, Contracting, Geotechnical Projects	Team Member	12 years
7.	**KA**	Project Engineering	Project Manager	17 years
8.	**RO**	Project Planning- Infrastructure projects	Team Member	10 years
9.	**KO**	Project Management	Team Member	12 years
10.	**NA**	EPC	Project Manager	20 years

7.3: Method of Analysis

A set of nine (9) themes were extracted from Structural Equation Modelling. The interviews from 10 professionals were taken to understand the reasoning behind the results which the researcher got after statistical analysis of data. The questions for interview were designed in order to understand the effects of various factors on trust as shown in Appendix V. The interviews were transcribed to understand the various patterns of information which helped in validating the results for model of trust. This approach has helped in organizing the textual interviews since the interviewees referred to the same themes in various questions. For example, interviewees did not explicitly address some themes but the researcher was able to capture these themes in the discussion during the interviews. The nine (9) key themes extracted from SEM and analyzed in interviews are as detailed in Table 7.2 below.

Table 7.2: Key themes of the research

S. No.	**Key Themes**
1.	Effect of Organizational Culture on Trust in section 7.4.3
2.	Effect of Communication on Trust in section 7.4.4
3.	Effect of Diversity on Trust in section 7.4.5
4.	Effect of Team Member Characteristics on Trust in section 7.4.6
5.	Effect of Leadership on Trust in section 7.4.7
6.	Effect of Task- Technology Fit on Trust in section 7.4.8
7.	Role of Cohesion as a mediator on the effects of Organizational Culture, Diversity and Team member characteristics on trust in section 7.4.9
8.	Role of Conflict as a mediator on the effects of Organizational Culture, Diversity and Communication on trust in section 7.4.10
9.	Role of Experience in handling diversity and communication issues in section 7.4.11

7.4: Interpretation of Interview results

This section explores the contents of the findings from the interviews and analyses them qualitatively. The following subsections describe and report the main themes as perceived by the participants.

7.4.1 Issue of Trust in virtual project teams in construction sector of Middle East

The development of trust in virtual environment is the complex phenomenon. It is found that trust plays a vital role in the performance of virtual project teams. The researcher looked for an answer from the participants to the question of importance of trust in virtual project teams for the Middle East. All the participants were of the view that trust is a great contributor for the efficiency of the virtual project team.

An interviewee RA confirmed the importance of trust by stating that "*I think it's an important requirement for the effective working of the virtual teams as we are interacting with team members whom we have never even met. Just to quote, let's say a new employee asks us for an important budget related information, so I will myself be reluctant to share it with him because I would not be able to trust him just like that. Sometimes we are dealing with government projects, when we take government projects, they have lot of rules and regulations regarding sharing of data. So that time, we have to be careful that the persons whom we are speaking should not leak the information. So, TRUST is an important parameter of bonding between team members"***.** PR stated that *"it is difficult to assess teammates' trustworthiness without ever having met them"*. NA indicated that *"it is difficult to bring in the trust factor in the virtual teams as they are dispersed geographically."* RA highlighted that *"people may not initially have trust in one another due to the lack of knowledge about their team member's past or present intentions"*. VI further added "*Actually, it's easy to say but it's very difficult to establish trust among people. The teams sitting at different locations, have different backgrounds, different nationalities- it really becomes challenging sometimes to communicate and build trust amongst them."* SH raised an important point that *"As the virtual teams are short lived and within that time, you have to form the team, build the relationships and then bid for that project. So establishing trust is a major challenge."*

The trust is considered as the biggest challenge in virtual project teams as lack of trust affects the information sharing among the team members. The information sharing across different locations of teams is required for the successful completion of construction projects. NA confirmed by saying that "*If there is no trust among team members, there would be great difficulty in sharing of information and ultimately project might suffer."* AS provided the researcher with an example by saying *"I think the major issue which I have seen during my initial days of work is that the team members do not trust each other. Especially when I started my career I was in India and we were having work with US office. So the primary understanding issue we were facing is that they were thinking that these are the people with Indian mind-set. They may not be knowing the way of doing project. Their main concern is lack of knowledge and whether they have required experience or not. And this resulted in*

lack of trust and sharing of information used to be of least priority." KA indicated that "*In several projects, I have seen that absence of trust have highly disrupted the flow of information among virtual team members, which have often lead to coordination problems."*

It can therefore be concluded from the answers of the participants that trust is considered as important parameter for the successful completion of projects. It is very important as lack of trust results in loss of information exchange between the team members of the virtual project teams.

7.4.2 Challenges involved in building Trust in Virtual Project Teams

The vast and varied experience of participants urged researcher to ask them about the major challenges in building trust in virtual project teams in construction sector of Middle East. The participants provided a detailed information about the challenges faced by them during their tenure as either team leaders or team members for their projects. The challenges are divided into seven categories from participants' point of view and are shown in figure 7.1.

According to AS, "*The lack of communication and the time difference between different countries are the major challenges for building of trust among team members".* RA confirmed that, *"As the teams are at different geographical locations, it is difficult to build respect, affection and care and this leads to lack of cohesiveness. And this leads to distrust among team members."* NA added that "*Lack of clear objectives and goals in an organization leads to distrust among team members as they are not sure of what they are supposed to do."* KO pointed out that "*The unresolved conflicts and employee dissatisfaction leads to problems among the virtual project teams. Also lack of proper reward policy in an organization leads to dissatisfaction among employees leading to distrust among employees".* SH revealed that "*A fair policy of team evaluation always leads to encouragement among the team members. The biasing policy of team evaluation always leads to distrust among team members and hence they stop sharing the information which leads to delay in the execution of the projects."* PR confirmed that *"Trainings on conflict management and personality development greatly helps in building communication skills which enhances the*

relationship bonding among the team members. Also, the team building exercises greatly helps in understanding the team mates and helps to reduce the friction among the team members."

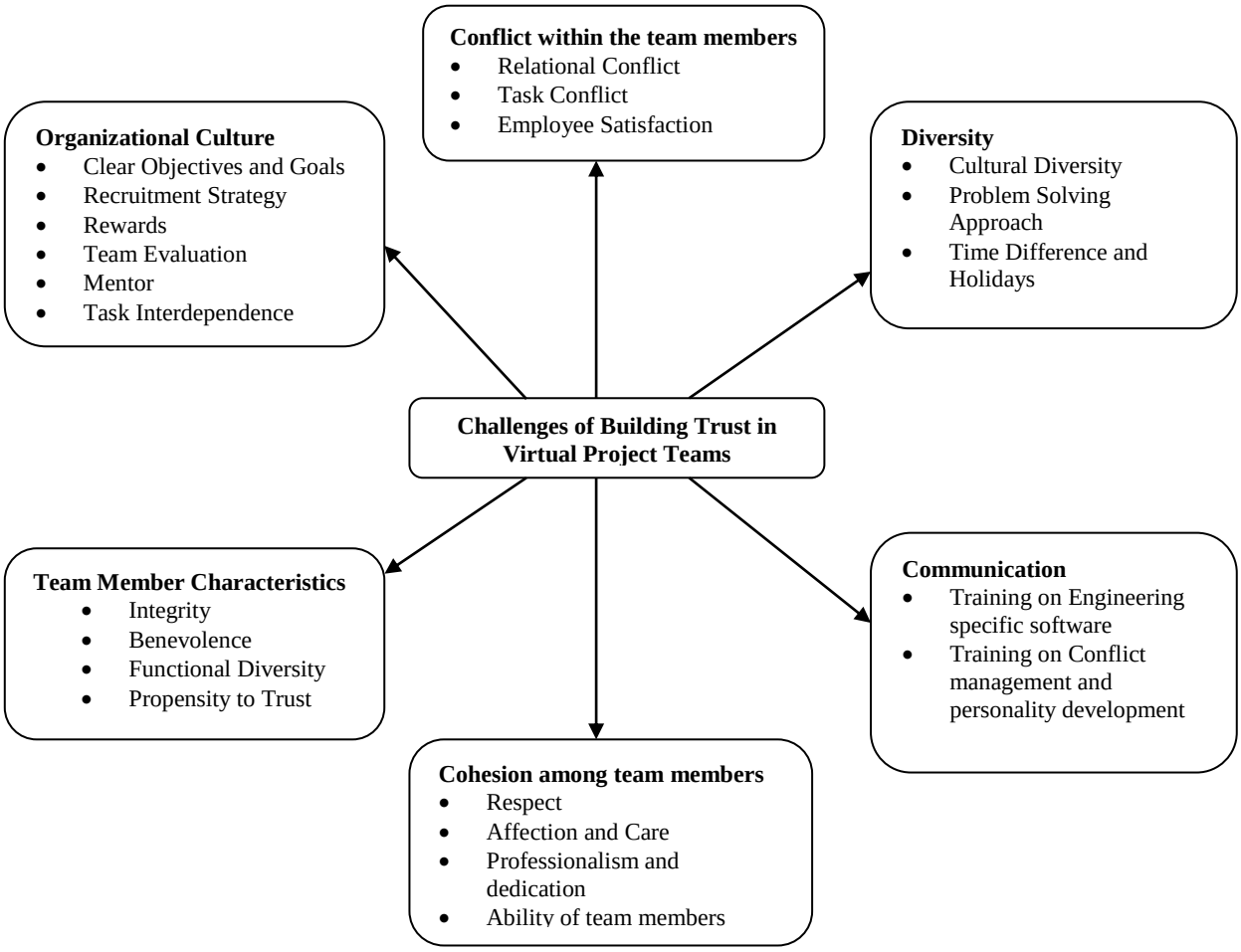


Figure 7.1: Challenges of Building Trust in Virtual Project Teams

Both RA and KO were of the opinion that *"The cultural diversity brings in some issues which sometimes leads to confusion and distrust among the team members"*. RL highlighted the importance of team member characteristics in building the trust, *"It is very important to have positive traits in team members' personality which greatly helps in building the trust. Lack of integrity, Benevolence and not having propensity to trust attribute in team members leads to distrust among team members."*

Therefore, relevant stakeholders and senior management of the construction companies need to acknowledge and highlight these challenges to find radical solutions in developing trust among team members. It is very important for project

managers of construction firms to understand these issues in order to have proper coordination among team members who are geographically dispersed. By understanding these challenges, it should be WIN-WIN situation both for management and virtual project teams.

7.4.3: Trust and Organizational Culture

Organizational culture includes norms regarding the free flow of information, shared leadership, and cross-boundary collaboration. The organizational culture consists of clear objectives and goals for the team members, recruitment strategy of the company, its reward structure, the process of team evaluation , availability of mentor in organization and degree of task interdependence in the organization. **All the interviewees agreed on the findings of researcher that organizational culture has a positive effect on trust building in virtual project teams. This can be proved with the below discussed topics of intervieews and relevant literature.**

The success in creating a virtual world will depend on how **clearly the objectives** and processes are defined for the accomplishment of the objective have been designed (Lipnack & Stamps, 1997; Norton & Smith, 1997). NA in his interview believed that " *Team members who are not knowing what they have to deliver and when they need to, are at higher level of personal risk which is central to trust building and this has to be made clear by the organization where they work."*. PR stated that " *When the team members are committed to the team objectives, it brings in the success of entire team as they are very clear about their long-term goals."* Further RL stated that " *If the goals and objectives in an organization are made clear and agreed upon, this greatly reduces the uncertainity regarding performance expectations. These goals also challenge team members giving them a hightened sense of urgency relative to accomplishing team based objectives.*" The interviewee KO agreed by stating that " *A transparent organizational culture which sets clear objectives for its teams and employees enhances trust among its staff and hence the teams."* Also RA insisted that " *Employees of an organization which has set clear objectives for them are happier than the organization which has not done so far. But if the organization does not give clear objectives, it's always like a haphazard thing because they donot know for what objective they are working".* Therefore, these goals and objectives help to build a

collective team identity, fostering the co-operative behaviours necessary for trust buliding in teams.

Team selection is another factor which differentiates successful teams from unsuccessful ones. RA believed that *"The selection criteria which an organization uses greatly affect the type of people that will be in teams. The organization needs to recruit people that are most suited for a particular project".* If that does not happen, there is high risk of distrust among the team members as they do not trust teammates' capabilities. KA stated that *"Improper hiring policies of the organization brings in lot of discomfort and distrust within the team."* PR insisted to have *"Good recruitment cell which has a strong HR who chooses the right kind of candidate for right type of project. It greatly helps to bring in the positive changes in the team, hence building trust within the team."*

(Barkhi et al., 2004; Barkhi, 2005) examined **rewarding t**eammembers based on individual decision outcomes or on team decision outcomes. They found that rewards greatly increase the trust of team members in the organization. The interviewee AS added by saying that *"When members' contributions to the group cannot be identified readily, they respond by identifying less with and contributing less to, the group."* KO indicated that " *A clear incentive structure helps in improving attitude in virtual team members."* RL raised an important point that *"The incentives with a supervisory component is the most effective way for improving the attitudes of virtual team members."*

Team evaluation refers to mechanism of fairness of outcomes, fairness of decision making procedures, fairness of interpersonal treatment and adequacy of information about decision making procedures and outcome distribution (Bryant et al., 2009). According to the intervieew SH " *The team members become more confident when there is a fair procedure of team evaluation as it greatly increases the trust among the team members. They starts believing that there is no biasing as far as the evaluation is concerned and hence a greater productivity is achieved."* RL and KO believed that "*A fair evaluation of team which does not include favoritism becomes a motivational tool for trusting the organization and reflects in the trust for team members too." AS*

stressed that " There should not be any subjectivity in the evaluation of team , otherwise it brings in lot of anger within the team." KA shared his experience by saying that " *In my previous organization, there was biasing in evaluation of teams' work and the employees. It created so much restlessness among the team members that they were not ready to trust not only other colleagues but their team mates as well".* RA shared that " *In Middle East, the organizational policies goes by government rules and if evaluation does not get executed fairly, the employees can file case against organization. So in that perspective, the team evaluations are kept very fair."*

Mentors in an organization plays a great role in developing trust among the team members. In a virtual work setting, as the employees are working in different locations than their managers, the opportunity for face-to-face contact is limited. This means that the manager has significantly fewer opportunities to view employee behavior than would exist in a conventional work setting . The trust can be used as a coordination and control mechanism in the workplace as observing behaviors are no longer a feasible solution in a virtual workplace (Lipnack & Stamps 1997). RO believed that " *If the team member gets emotional support from somebody in the organization, the half of the job is done in building trust among the employees."* PR stated that " *Even though our manager is at different location, occassionly when he supports and guides us in our work, it becomes great motivational factor."* VI enforced that "*Often the frustrations of virtual team members greatly demotivates the team and affects productivity of the team, therefore the guidance from somebody in the organization be it a team member or superior certainly helps in bringing the team together."*

Amah et al., (2013) defined **task interdependence** as the degree to which work requires interaction among employees. The higher the task interdependence, the more effective the team. The interviewee KO indicated that "*The interdependence of task greatly motivates the teams to work together as they are able to see the impact of their contribution in their projects as success"*. PR highlighted the importance of it by saying that " *Task interdependence also shows the dependence of one's performance on one's skills and actions. This gives the team members a great sense of*

responsibility among the team members and helps in team building". SH insisted that "*As the task interdependence increases in the projects, there has to be more interaction and exchange of information. This increase in interaction has been seen as positively linked to the trust within the virtual project teams."* NA confirmed the importance of task interdependence by saying that " *The task interdependency facilitates trust development as it involves increased need of adjustment, communication and coordination."*

Therefore, **all the interviewees highlighted the importance of organizational culture in building the trust in the organization**. They stressed that it needs a strong commitment of senior management with respect to the strategic planning of virtual project teams. Organizations should provide appropriate support systems which include clear objectives and goals, evaluation and compensation systems, mentoring and degree of task interdependence.

7.4.4: Trust and Communication

The development of trust is linked to increased communication among members (Jarvenpaa, Shaw & Staples, 2004). The communication aspect of team members consists of degree of communication and requirement of training by the team members of the virtual project teams. **The participants agreed to the results obtained by the analysis of the data. They strongly believed that the presence of communication affects positively in the building of trust. This has been supplemented by the relevant literature and findings from interviews.**

Anderson *et al*. (2007) suggest that the effective use of communication, especially during the early stages of the team's development, plays an equally important role in gaining and maintaining trust. The interviewee RL is of the view that *"Communication is the biggest challenge for virtual project teams as they are globally distributed. Therefore, they need to have more communication. Initial kick off meetings are very much required to build trust among dispersed teams."* RO indicated that *"Communication is the key to build trust but at the same time it's a great challenge for virtual teams. The organizations need to play an important role in establishing effective communication within the teams. This can be accomplished by*

imparting regular trainings on problem solving and on communication skills." When asked to the participants whether language acts as a barrier to the development of communication, all of them were of the view that *"In Middle East, the common language is English. So the language is never a barrier in communication as anybody who seeks employment here needs to have this minimum requirement."* PR stated that "*The teams who send more social communications achieve better social and emotional relationship resulting in more trust among its team members".* KO and RL added that "*The teams are highly satisfied when there is effective coordination and communication."*

Amah, Nwuche, & Chukuigwe, (2013) suggested that managers can send employee for training to acquire skills and experiences that will make them good team players. The training could allow employees to experience the satisfaction that teamwork can provide. The training could be in the form of workshop to help employees improve their problem solving, communication, negotiation, conflict management, and coaching skills. Adding to this, NA suggested that "*In case of new technology to be used by virtual team members, computer training related to more advanced skills may be used to improve virtual teams' efficacy."* VI gave an example of his own organization, stating that "*Our organization imparts training on interpersonal skills, conflict management and problem solving so that when the employees go back to their respective virtual project teams, they should perform and communicate in a more acceptable way with a positive approach. This surely makes team members comfortable with each other and helps in building the trust."* AS was of the view, "*In my organization, they do a special focus on communication. They involve everyone in trainings of conflict management, interpersonal skills, to communicate and write effectively. With this, the teams can respond to each other more efficiently. Definitely communication creates good environment to build trust in virtual team members." And finally PR indicated that "Our UAE branch gives high importance to intra-company communication and even imparts various trainings on corporate communication and interpersonal skills. This greatly affects positive building of trust."*

Therefore, the senior management and project managers have to build up strong communication among virtual team members by having greater degree of communication and developing various training programme. This surely results in increased cohesiveness and team satisfaction.

7.4.5: Trust and Diversity

The diversity of team involve functional and cultural diversity, language barriers, problem solving approach of team members and time difference and holidays for virtual project teams. **According to literature, Diversity of team members is negatively associated with the development of trust.** L. Peters & Karren, (2009) stated that diversity among team members can cause variations in their attitudes, values, and overall performance, perhaps giving rise to conflicts when team members interact. Shachaf, (2008) found that since cultural diversity increases the complexity, conflict and confusion, it sets higher challenges for leaders and members. Cultural and language differences results in miscommunication, which jeopardized trust, cohesion, and team identity. (Curşeu & Schruijer, 2010) proposed that team diversity has a positive impact on conflict and a negative impact on the emergence of trust. Usually the team members trust the people in the team who belong to the same culture as they consider them as more trustworthy than the other diverse members (Zolin *et al.*, 2004). Functional Diversity involves range of functional assignments being carried out by teams during their tenure. It is believed that it is associated with differences of opinion and perspective and it is possible that these difference may result in less effective performance (Bunderson & Sutcliffe, 2002).

But in reality, **the data analysis done with respect to the Middle East resulted in the positive relationship of diversity with the development of trust within the virtual project teams.** This results is being validated with the interviewees' views as well. All the participants suggested that in the Middle East, the diversity in terms of functional actually increases the efficiency of the teams and hence increases the confidence of team members with each other. This is being validated by the comments of the interviewees discussed as follows.

According to the experience of interviewee AS, he said that "*I believe your findings are correct. I could see the reason that maximum percentage of people working in virtual project teams is non-local. They are working here from other countries. And they are here for basically to earn money and have a better lifestyle. The guy who works in a country other than his native country has always a fear of losing job. In order to survive here, he works hard and puts in extra effort to meet the project role and requirement. Even though the work ethics, cultures and background of individuals are different, their goal is to excel no matter how diverse the teams are."* PR and KO are of the view that "*In this region, people come from different countries and with varied nationalities. But when they come here, they all know that would meet such team members and in a way they are ready and mentally prepared to face the diversity. This preparedness not only helps them to adjust faster with their team, but also to develop trust with their trust mates."*

RO and RL believed that *"In construction sector, we find great diversity in teams, diversity in the way the team members approach a problem. And this gives team members different ideas to approach a particular problem giving them alternate solutions for a problem."* RA and VI indicated that *"People from different nationalities come here and people believe that the language would be a major concern. But the work mostly done here is in English."* They further stressed that even when the company people recruits people, they see to it that a person understands and speaks English. So the language is not a problem in Middle East. NA and RA stressed that *"The diversity brings in lot of experience from different countries. As the people have to work in the same project, the experience of team members not only helps each other but the team members also develop interest in knowing new things from other person's experience."*

The Community Development Authority (CDA) of Dubai conducted social survey in 2015 that aimed to measure the current levels of the key performance indicators of the Dubai Strategic Plan. The survey result showed that cultural diversity is a factor that builds social relationships between the Dubai residents. It enhances trust among the residents resulting in the increase of respect among each other. It is shown in figure 7.2.

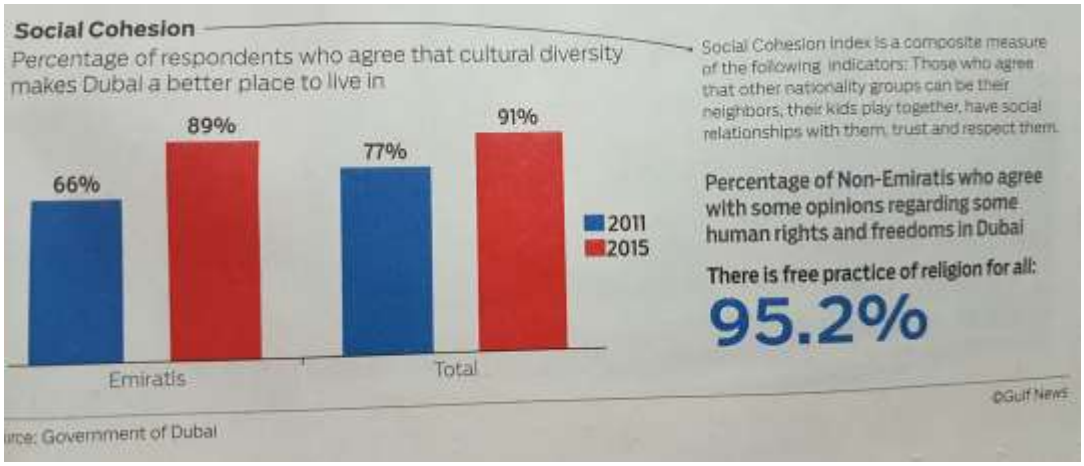


Figure 7.2 Cultural diversity brings Trust (Source: Government of Dubai, Gulf News 20th Dec.2016)

Hence, the diversity brings in lot of positivity in building the trust as far as the Middle East is concerned. The cultural and functional diversity helps in sharing the varied experiences of the members and helps in increasing the productivity of the teams. Also the language and time zone is never considered a hindrance in the Middle East.

7.4.6: Trust and Team Member Characteristics

In some relationships, trust is only dependent on simple basic variables but as relationships mature and members get to know each other, individuals learn to trust or distrust the team members according to their characteristics (Lewicki, McAllister & Bie, 1998). The team member characteristics involves ability, integrity, benevolence and propensity to trust. Benevolence is the willingness of a party to benefit another. Ability is the belief in the trustee's ability or skills to fulfil its obligations as expected by the trustor. Integrity is a party's expectation that another consistently relies on socially accepted principles of behavior(Mayer et al., 1995). **The results of research showed that the team member characteristics affects positively the trust building in virtual project teams. All the participants of the interviews believed in the results and gave following supporting comments as discussed below.**

The interviewee PR suggested that " *The team members do have different characteristics that affects the trust building in virtual project teams. The ability, integrity and general willingness to trust others greatly encourages the trust among the team members."* SH and NA are of the view that " *everybody will love to have friendship with an honest guy as he will never backstab you. Similarly, if the integrity*

of the person is intact, then definitely team members would trust him. Then the person with open mindedness, believes everyone will bring people together." They also believed that team members may not know each other initially, but as relationships mature and members get to know each other, individuals learn to trust or distrust the team members according to their characteristics. AS suggested that " *If you have a team member who is positive towards the team, who is enthusiastic, who is very diligent and who is a team player, it really helps the team."*

Further KA stated that *" the virtual teams operate in an environment full of uncertainty. Thus, the trustor has to believe that the trustee has good intentions regarding the relationship even in the absence of any legally binding formal agreement or previous commitment."* KO insisted that "*The more competent members in the team, the higher the level of team trust. Similarly, the higher the level of one's willingness to help and integrity of team members, the higher the level of team trust. Also an honest and dedicated person is trusted more than a cunning fellow."*

Therefore , it's a challenge for a project manager to find out those team members who are not contributing to the level which is expected and they should know how to handle these cases. So in order to build trust and to have a successful project, it's very important that the team members should contribute more towards the goal. Also it is very important that the manager' integrity and zero tolerance to violation of commonly set of ethical principles to motivate the team members to assume responsibility for their decisions an actions and act in a trustworthy way.

7.4.7: Trust and Leadership

According to the literature, leadership in an organization plays an important role in team's success. Team leaders provides coaching and support. They also ensure that the teams are given responsibility, adequate resources and the necessary authority to make decisions and ensure accomplishment of tasks (Amah et al., 2013). Chutnik & Grzesik, (2009) indicated that the leader should provide continuous feedback, should be sensitive to team members' problems, clearly define responsibilities and exercises authority and maintains a consistent attitude over the life of the project. **As per the**

literature and the hypothesis constructed by the researcher, the leadership skills of manager play a positive role in increasing the trust among virtual project teams.

However **after collecting data from the professionals from construction sector in the Middle East and analysing it, it was found that leadership skills of manager actually do not have any effect in the development of trust among virtual project team members in the Middle East.** The results are validated by taking interviews of team members and team leaders of construction sector.

As we see lot of globalization happening in the Middle East, the virtual project teams are need of the hour because varied expertise is needed at different places. In the Middle East, more and more families are having their business like Al Gurair, Al Jaber, Arabtech Holding in Dubai; AlKifah, Al Khrafi in Kuwait; Bin Laden Group, Al Mabani in Saudi Arabia and Galfar in Oman. Under these situations, they just have to hire people and put them on job. If the team works efficiently, then it's fine otherwise they hire different set of people. So there is no question of feedback or support from team leaders. And this is what the researcher also got a result of interviewees. As per the interviewee PR, "*Actually, things here in the Middle East seem to be different than other areas. Team members are constantly being monitored for performance, so whether or not they are encouraged by the project manager, they will still perform as they have to show results for their survival. Therefore, Leadership actually does not matter here."* KO added to this by saying *"I think virtual team members in the Middle East are quite self- driven, focused on their work and concentrate more on target completion of task. It does not matter whether or not they are being pushed by a superior."*

RL, RO, RA and NA made a point by saying that *"People here in Middle East have come here to earn and survive as long as possible as the income here is tax free. People understand that the teams in which they are currently associated with may change in the next project, even their boss or project manager will also change. So the team members still have to show their performance and establish trust irrespective of the motivation of their team leader."* KA insisted that "*Under normal projects,*

leadership matters a lot. But in context of virtual teams, the superior may or may not be present at all the time, he may be based in a different office and different location. Actually, sometimes it feels that there is nobody to pat on your back when there is some achievement. So, in virtual context, the leadership of the superior does not matter much, people would still do their job to the best whether or not the boss is there."

However, **the project managers, two out of 10 interviewees, when interviewed gave a different perspective.** They said it's very important to have good leaders in a team and the motivation and support of leader is very much required for the effective working of teams. SH was of the view "*The teams are short lived. The initial phase of the team would definitely need a team leader and members would look only at the team leader for guidance."* However he also insisted that the team leader is not required at every stage of the project. AS stated that *"Leadership is quite important. But it also depends on the kind of projects taken up by virtual teams. If the virtual teams are working more on productive kind of projects where innovation is concerned and requirement is not project specific, leadership is not required. But if the project is very specific and unique, then it's very important to have a good leader."*

Therefore, even though literature says that the team members rely on their managers to keep them informed of necessary information and to support their activities with effective feedback and recognition. But actually in context of the Middle East, the professionals believed that the leadership is not very important as people have come here to earn money and they do their jobs without even being mentored. This is also primarily because the team members want to stay longer here. As the virtual teams are short lived, whether or not they are having a superior to pat on their back, they need to give their best so that they can be absorbed in another team based on their performance.

7.4.8: Trust and Task- Technology fit

Dakrory & Abdou, (2009) found that task-technology fit is important in virtual teams' life cycle to evaluate the possible fit between various technologies available to virtual teams and the tasks which are called upon to be completed. The literature says it's

very extremely important to ensure a fit between the task, the technology and the structure of the work which a virtual team is supposed to carry out. Maznevski & Chudoba, (2001) proved that if virtual team members are able to adapt the technology and match it to the communication requirements, the virtual teams are more effective. **Based on the literature it was proposed that the task-technology fit relates positively to the trust of the team. But the data analysis of the data collected for the Middle East shows that there is no effect of task- technology on the trust building of the virtual project teams.** This is proved by the following discussion.

As per the view of the interviewee AS and KA, *"The task –technology improves the efficiency of the virtual project teams. But it won't have any effect on trust building in virtual team."* As they believed that communication within the team has to be strong for bringing the trust within the teams. AS and VI added that "*In construction sector, we have various tasks as engineering, procurement, planning and construction. Different software for designing, procurement, inventory management and planning are required. The non- availability does not affect the trust of the team members. Rather they become more focused on getting these software in the team to increase the efficiency of the project."* PR and RL stressed that "*Even though at times, the team members do not know the operability of these software, they learn it in due course of time. But at any times, it does not affect their trust building in any ways."*

Therefore, it is recommended that the organization should provide right technologies for the projects to increase the productivity of the teams as there are task with different complexities. But in anyways, even if the technology is not present for a particular task, the trust among the team members won't get affected, but there would be decrease in the efficiency of the teams.

7.4.9: Role of Cohesion as a mediator on the effects of Organizational Culture, Diversity and Team member characteristics on trust

A cohesive group is one in which the members are attracted to the group and to its task (Kozlowski & Bell, 2003). The team effectiveness, satisfaction and effective communication have been linked to cohesion in the distributed environment (Gonzalez et al., 2003; Chidambaram, 1996). It is believed that when the teams are closely knitted together, they increases the probability of achieving organizational

goals. This leads to increased trust within the teams. Although diversity is intended to yield a variety of perspectives and solutions, these perspectives are unlikely to emerge if team members are reluctant to interact with individuals who are different (Jackson, 1992). Studies suggest that heterogeneous teams are less cohesive than homogenous teams (Thomas, Ravlin, & Wallace 1994; Knouse & Dansby 1999), and thus less likely to interact at a level that produces superior outcomes. Tsui, Egan, & O'Reilly (1992), report that there is an inverse relationship between work-unit diversity and psychological attachment among group members. Kanawattanachai & Yoo (2002) proved through an empirical study that trust relies more on cognitive components such as competence, reliability and professionalism than affective ones such as caring, and emotional connection to each other. Nakayama et al. (2006) pointed out that trust is related to competence, loyalty and receptiveness. Mukherjee et al., (2012) stated that members of virtual project team will take their decision to trust, cognitively, after judging the overall ability, benevolence and the integrity of the trustee members of the team. If the bonding between the team members is strong, then characteristics of team members greatly enhance its effect on trust.

From the literature, it is believed that cohesion increases the positive effects of organizational culture on trust, mediates the negative effect of diversity on trust and increases the positive effects of team member characteristics on trust. During the data analysis for the data of the Middle East, it has been found that all these hypotheses were supported. The results were validated by the results of the interviews of the professionals working in construction sector of the Middle East.

Cohesion on Organizational Culture : According to interviewee RA "*when the members are comfortable with each other, they bond with each other and target any organizational goal."* NA was of the same opinion and believed that " *When the members bond between each other and target any issue, I have seen that trust and relationship develops faster in the team*". KO mentioned that *"People with varied experiences work together in a virtual team to accomplish a common task. Cohesion definitely builds trust in the team as well as in the organization."* RO indicated that "*Discussions on conflicts which are focussed towards a common goal, bring the*

virtual team members closer and establishes trust and bonding amongst them and brings in trust in the organization culture."

Cohesion on Diversity : The interviewee RA stated that "*As far as my experience is concerned , I have seen bonding in the team benefits the diversity of the team and helps to build trust even though the members are culturally different"*. Both NA and VI were of the view that " *In the Middle East, I have seen that diverse cultures perform better and trust each of their team members than in a homogenous culture because of varied experiences. This has positive effect on building the trust in virtual teams."* RO indicated that *"cohesion brings in team satisfaction and enhances its performance no matter how much a team is diverse."*

Cohesion on Team Member Characteristics: The interviewee RA was of the view that " *Cohesion brings the team members together when we see that the person is honest and maintains integrity and trust automatically increases with positive qualities of team members*". Both NA and VI suggested that *" Bonding always helps in increasing the level of trust in virtual project teams. The respect the team members have towards each other and the consideration of each other's feelings plays a major part in developing trust."* The interviewee KO and RL added that " *I think a team which is dedicated to its work and respects each other's opinion professionally, I feel it's more aligned than other teams. This surely helps in enhancing trust in virtual project teams."*

Therefore, **it is recommended for project managers and senior management to build strong sense of belonging within the team. This will help in enhancing the trust among culturally diverse teams and attaining the organizational goals through the positive characteristics of teams.**

7.4.10: Role of Conflict as a mediator on the effects of Organizational Culture, Diversity and Communication on Trust

Conflict is broadly defined as incompatibilities or perceptions by the parties involved in a task and that they hold different views on different matters (Boulding, 1963). In terms of organizational culture, the conflict based on the task distribution and process

execution leads to alternative solutions to the problem. This increase the achievement of organizational goals in most efficient way. With respect to studies related to the emergence of trust and conflict to team diversity, It has been argued that there is a higher probability for a team member to trust similar others than dissimilar ones. Therefore, trust is more likely to emerge in homogeneous rather than in heterogeneous teams (Costa, 2003). Curşeu & Schruijer, (2010) proposed that team diversity has a positive impact on conflict and a negative impact on the emergence of trust. With respect to communication within the virtual project teams, the dispersed members always assume that team members from the teams at head office are hiding some information from them which causes friction between the team members (Crampton, 2001; Sarker & Sahay, 2002). A. Kankanhalli et al. (2000) stated that the characteristics of communication technology, especially in a virtual team, may contribute to team conflict. When there is a lean medium of communication among team members, it results in confusion and different interpretations of the communication.

From the literature as mentioned above, it is believed that conflict increases the positive effects of organizational culture on trust, increases the negative effect of diversity on trust and decreases the positive effects of communication on trust**. During the data analysis for the data of the Middle East,** it has been found that only first hypothesis got supported whereas second and third did not. Infact it is seen that conflict does not increases the negative effect of diversity and conflict does not play any role in the increase or decrease the effect of communication on trust. The results are validated by the results of the interviews of the profesionals working in construction sector of the Middle East.

Conflict on Organization culture: The interviewee NA proposed that *"I think positive and healthy discussions during conflicts helps in bringing out good results."* KO added to this by saying that *"Task specific conflicts encourage discussion within the team and do have positive outcomes. Such discussions, which are focused towards a common goal, strengthen relationship amongst the virtual team members and bring in trust in the teams and organization.*" VI indicated that *"The type of the conflict dictates the trust within the team. Conflicts do happen in big projects, where there are*

brainstorming sessions happen as different team members do not agree with others. These brainstorming sessions are taken as finding alternative solutions to the problems until the conflict does not become personal and its frequency needs to be minimal."

Conflict on Diversity: The interviewee NA suggested that *"Conflict is seen to bring in a healthy discussion in diverse teams. As the team members are here to earn a living and stay longer, they trust each other and the healthy discussion amongst them help in developing trust."* Both RL and RO shared their own experience and mentioned that *"In my company, what I have observed is that we generally face task specific conflicts rather than relationship conflicts. So till they remain in the interest of the task and do not become personal, conflicts generate positive discussion, which increase bonding between among members and develop trust."*

Conflict on Communication: The interviewee NA believed that "*I think that since the people who work in the Middle East are well prepared to work in multicultural organization, they tend to focus on completing the tasks."* He believed that the team members communicate professionally, irrespective of the fact whether they have a conflict or not with other team members. The interviewee KO and RL together believed that "*The teams become more efficient with increased communication, which tends to develop high levels of trust among members, irrespective of the fact whether or not they have a cohesion or conflict with the other team members whom they are interacting with."*

Therefore, the senior management and project managers have to see that there happen healthy discussions within the team. The discussion should not take the face of relationship conflicts as they diminished decision creativity and quality, erodes team unity and commitment, and curtailed decision acceptance and support. Also the frequency of poorly managed conflicts should be minimal as they not only damages relationships but limit cognitive functioning. In general, the conflicts should be handled with positive outlook for increasing the productivity of virtual teams otherwise they bring negative influences on trust.

7.4.11: Role of Experience in handling diversity and communication issues.

Experience in virtual project teams would be used as moderator variable. It is important, to understand how does experience affect the relationship between diversity and conflict, diversity and cohesion, and communication and conflict. These relationships are of utmost importance as they badly affect the building up of trust in virtual teams if they are not taken care. Through the data analysis, it's been agreed that experience in virtual project team will moderate the relationship between diversity and conflict and also for communication and conflict in that the relationship is weaker for individuals with high levels of experience. Also it has been shown by data analysis that whenever there is a cohesion in the team, the relationship between diversity and cohesion does not get affected by their experience in virtual project teams. Actually it does not matter at all in that case.

The interviewees gave various reasons in support of the results and provided a new insight to the findings. According to interviewee NA *"The experience should not only be termed as number of years, but also in terms of number of projects handled."* When a team member has had high experience of working in multicultural teams, they would be able to work and establish communication in any kind of diverse teams. This means that they are not affected by the diversity of the team. These experienced team members tend to work towards strengthening the cohesiveness, building and maintaining trust amongst the members and reducing conflicts within the team. SH gave a different perspective to the definition of experience. He mentioned "*The experience of a team member with good characteristics is very much needed. An experienced person with open mindedness will take your opinion also. Whereas a person with more experience and with arrogance, will have conflict with others by assuming that he is the best."* So it's always better to have proper proportion of some experienced guys and low experienced guys. The low experienced guys would always balance the team of highly experienced people and helps in strengthening the team by increasing the cohesiveness of the team.

AS was of the view that "*when you have too many experienced persons in the team, they try to create their own procedures of working and results in conflicts."* They

implement their own rules based on their earlier experience. But sometimes it causes a great restlessness in the team. Therefore there should be proper mix of young and experienced people in the team. Both RO and RL insisted that "*The young team members are very energetic and are very keen on learning technology. But they may not be able to resolve or communicate complex issues"*. Hence a right mix of professionals is required.

Therefore the management and project managers need to very careful while recruiting people for the virtual project teams. There needs to a proper mix of experienced and fresh graduates for the projects. As far as experienced people are concerned, they are able to handle the things easily and will be able to convince people. They know how to handle issues and convert the adversity into positivity. Though the experienced people are good in managing things but they may not be having energy to accelerate the projects. Therefore young and sometimes fresh graduates come into picture. These graduates can work on latest software. They may not be able to analyse results of a particular software for which they would be requiring assistance of experienced people. Therefore great amount of conflict is removed if the teams are having proper mix of people in team.

7.5 Benefits of Trust in virtual project teams

The participants believed and convinced that trust in virtual project teams offers benefits to the construction companies. Studies also showed that teams with consistently high trust levels are more capable of dealing with uncertainty and complexity than those with lower levels. The participants were asked to identify the benefits of trust in virtual project teams based on their experience while working in construction sector of the Middle East. They identified four benefits of trust namely Improved performance of the team, Better collaboration within team, Sharing of knowledge and faster execution of projects with minimized delay as shown in figure 7.3.

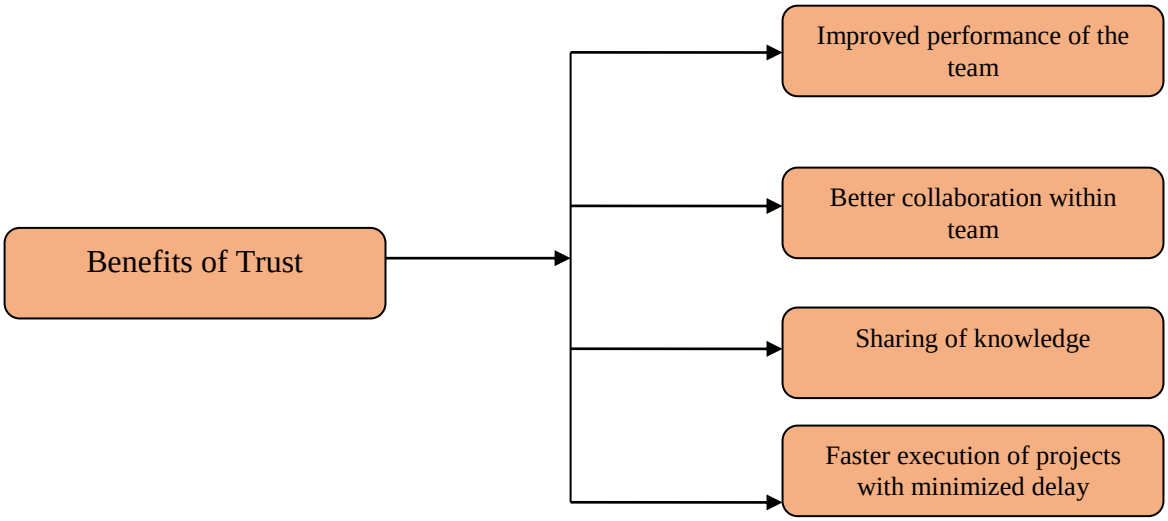


Figure 7.3: Benefits of Trust

These benefits are highly influenced by the participants' answers and are summarized next.

7.5.1 Improved Performance of the team

The participants were of the opinion that when the teams are provided with clearer goals of the organizations, it resulted in great motivation and helped in building trust in the teams. The companies can have their recruitment policy in place along with transparent nature of its working. The recruitment strategy of the organization brings in the right kind of people in the team. This not only builds the trust but also results into brand and reputation benefits for the companies. Positive perceptions and solutions of diverse teams lead to increase in the performance of the teams. The communication component of trust plays an important role in promoting effective communication of project plan and better understanding their team mates. This is highly recommended by the participants as the teams are globally dispersed and needs to have a well - defined communication structure. Many participants explained the importance of necessary skills, competencies and abilities within the team. The teams needs to be structured with proper mix of young fresh graduates and experienced people. This will lead to better understanding in the teams and helps in resolving conflicts within. As the teams are culturally diverse and people from across the world form any virtual project teams, there tends to have conflicts within the teams. The participants believed that in order to have increased performance of the team, the conflicts should be limited to only task based and not relationship. They also stressed

upon that the frequency of occurrence of conflicts should be minimal. These parameters assist the teams in achieving their goals in stipulated time hence increasing the performance of the team. Therefore all the participants were of the view that having trust and confidence in the team greatly increases the performance of the virtual project teams in handling various projects.

7.5.2 Better collaboration within the team

Within the professionals interviewed, it was evident that they insisted that having trust in the team brings in better collaboration within the teams. They were of the view that those organizations which are having transparent rewarding policies will benefit from the teams. These rewarding structure encourages cooperative efforts of the team rather than the competitive feelings of the team. The team members start building up trust in the organizations as they know that there is no biasing involved in the evaluation of the individuals. Hence the participants stated that the team members becomes very proactive in collaborating with other teams as they know that they will be rewarded of their actions in bringing the execution of the virtual projects. The participants also believed that trust enables communication within the team. The frequency of discussions among team members increases with trust and helps in reducing the differences in perceptions of team members. As depicted from the literature and even participants agreed on the fact that the team members are likely to have more trust on people who have high integrity. The integrity of the team members enhances the partnership between the teams and results in completion of the projects. There were few participants who also believed that the when the team is closely knitted together in terms of their bonding, it helps in developing positive attitude towards team members. And this positive attitude helps in achieving the cooperation of other team members which results in better collaboration within the team.

7.5.3 Sharing of Knowledge

Almost all the participants highlighted the importance of knowledge sharing in the teams. It is believed by the participants that by recruiting the team members with necessary skills and competencies, the knowledge base of the organizations gets increased. And when the knowledge base is strong, the trust is likely to happen in the organizations. The sharing of information is very much required in the construction companies as one team is involved in tendering, the other in bidding of the project and

probably third goes for execution of the project. At every stage of the project, the sharing of information is required to manage the proper flow of events. The participants highlighted that the diversity in teams brings in lot of new ideas and experience and trust assists in sharing of these ideas within the team. This is quite necessary at some point in the projects where brainstorming sessions are required to solve the crises. Most of the participants insisted to have latest communication tools in the team which helps in increasing the communication among teams. The trainings on handling conflicts, improving interpersonal skills and on various engineering software yields a greater understanding in the team which helps in improving the sharing of knowledge. The participants also mentioned that trust brings lot of bonding within the team. When bonding is there, the teams are not hesitating in sharing of information. Therefore the companies should understand the importance of trust building in the teams and motivates the teams at all times.

7.5.4 Faster Execution of projects with minimized delays

As the globalization is spreading its wings in the Middle East, there is a strong need for boosting the economy of the company. The participants were of the view that the faster execution of projects within time frame will help in reducing the cost overruns of the projects. This will result in the financial benefits for the companies. Most interviewees stated that when the teams are given enough room in completing their deadlines through proper planning, it resulted in greater trust among the teams. The faster executions are also achieved when there is less delay in replies from the other teams, and the participants stressed that will only happen when the teams are having a great sense of trust within the teams. Also when the team is equipped with necessary skills and tools, it results in faster executions of the projects as there is no hindrance in the working of the project. Many participants believed that the emotional investment in trust relationships with people expressing genuine care and concern for the welfare of the team members greatly helps organizations to achieve their goals with minimized delays.

7.6: Summary

This Chapter has presented the empirical findings of the interview analysis. Semi-structured interviews were conducted with 10 professionals from construction companies of the Middle East. The Chapter started with the interviewees' details with

judgmental sampling being the selection method of the participants. Then the method of analysis is presented briefly and the rest of the Chapter has analyzed the results.

The findings which emerged from the interviews were organized into nine major themes: Trust and Organizational Culture, Trust and Communication, Trust and Diversity, Trust and leadership, Trust and Task- technology fit, Trust and Team member Characteristics, Role of Conflict on trust, Role of Cohesion on trust and effect of experience in building the trust in virtual project teams.

In the last section, the benefits of trust are being understood from the participants. From the results, it was clear that the trust helps in improved performance of the team, helps in better collaboration within the team, assists in sharing of the knowledge and reduces costs by faster execution of the projects with minimized delay. These benefits are also needed in Interpretative Ranking process to further stress on importance of components of trust.

In the next chapter, the relationships between various factors of trust are examined through Interpretive Structural Modelling. Then the Interpretive Ranking Process is used to rank these factors of trust with reference to its key benefits. These two techniques helped the researcher to understand and propose most important factors which are needed to be thought by the project managers and top level management to have trust building within the virtual project teams.

Chapter 8

ISM AND IRP RESULTS AND DISCUSSIONS

8.1 Introduction

Chapter 7 identified and explained the challenges, themes and benefits of trust building in virtual project teams in construction sector of the Middle East. The data analysis revealed the close interaction among different trust elements as well as challenges. This Chapter aims to examine the relationship between factors of trust building, to understand the mutual influences among these trust challenges, and to rank these trust factors with reference to its key benefits. To achieve these aims, this Chapter utilizes Interpretive Structural Modelling (ISM) and Interpretive Ranking Process (IRP) methods. ISM is used to develop a hierarchical structure for analyzing the interactions among the factors of trust, while IRP is used to examine the dominance of relationship of factors of trust against various benefit areas of trust building.

Following this introduction, the Chapter is divided into two major sections. Section 8.2 gives the detailed description of ISM for factors / challenges of trust building in virtual project teams. In Section 8.3, IRP is explained and discussed. Section 8.4 discusses the summary of the chapter.

8.2 Interpretive Structural Modelling

ISM is a computer-assisted learning process that enables individuals or groups to develop a map of the complex relationships between the various elements involved in a complex situation(George & Pramod, 2014). Its basic idea is to use expert's practical experience and knowledge to decompose a complicated system into several sub-systems (elements) and construct a multilevel structural model. It has three dimensions by each letters. Dimension Interpretive (I) is based on the judgment of a group of experts in that respective field. A group of expert decisions are collected and decides whether and how the variables are interrelated. Then, (S) is Structural, since on the basis of the relationship, an overall structure is extracted from the complex set of variables. Dimension (M) the Modelling which portrays the specific relationships of the variables and overall structure of the system under consideration. In other words, in ISM, I (Interpretive) stand for the outcome of judgment, S (Structural) stands for the extraction of outcome of a set of variables and M (Model) stands for the graphical representation of the specific relationship and overall structure (George & Pramod, 2014).

ISM is used to complement the quantitative and qualitative methods to facilitate a better understanding of the different trust building factors of virtual project teams in construction sector. It further assists in classification of these factors depending upon their driving and dependence power using indirect relationship MICMAC analysis. The proposed model provides a useful tool for project managers of virtual project teams of Construction sector to focus on those factors that are most important for building trust among teams, thereby enhancing the productivity of the team. Understanding the factors and their relationships will help construction companies of Middle East to address the major issues of trust building or at least understand them so that they can plan for them if they see distrust among the team members affecting the performance of the team. The findings revealed that these elements are highly interlinked therefore it was essential to structure these relationships.

Based on the statistical analysis of data through IBM SPSS software and by using structural equation modelling (IBM AMOS Ver22), the researcher have created a model of trust which constituted various factors affecting it either positively or negatively. The model of trust was validated with the experts' interviews. To add more weightage to the findings from quantitative and qualitative analysis, ISM technique was used to understand the relationships between various factors of trust. The different factors which affect the trust within virtual project teams came out to be

a) Organizational culture of the company
b) Diversity of the team members.
c) Degree of communication within the team.
d) Team Members' characteristics
e) Conflict within the team
f) Cohesion of the team

8.2.1 Steps involved in the development of Model using ISM

A stepwise procedure is to be adopted to develop a model of trust using ISM. The various steps involved in the ISM methodology are as follows (Ravi & Shankar, 2005):

Step 1: Identification of the elements that are relevant to the problem or issue.

Step 2: From the elements identified in the first step, establishing the contextual relationship among them. This represents the relationship indicating whether or not one element leads to another.

Step 3: Developing a structural self-interaction matrix (SSIM) of sources which indicates a pair-wise relationship between sources of the system under consideration.

Step 4: Developing a reachability matrix from the SSIM, and checking the matrix for transitivity. Transitivity of the contextual relation is basic assumption in ISM which states that if element A is related to element B, and B is related to C, then A is necessarily related to C. The SSIM format is transformed in the format of the reachability matrix by transforming the information in each entry of the SSIM into 1s and 0s in the reachability matrix.

Step 5: The reachability matrix obtained in the fourth step is partitioned into different levels.

Step 6: Based on the relationships given above in the reachability matrix, a directed graph is drawn and the transitive links are removed.

Step 7: The resultant digraph is converted into an ISM, by replacing variable nodes with statements.

Step 8: The ISM model developed in the seventh step is reviewed to check for conceptual inconsistency, and to make the necessary modifications.

The interrelationships among different challenging factors of building trust among virtual project team members in Construction sector of Middle East have been achieved through these steps mentioned above.

8.2.2 Structural Self-Interaction Matrix (SSIM)

Six factors affecting the building of trust are identified through the statistically analysis of variables found through extensive literature review. The next step is to analyse the interrelationship between these factors using ISM. ISM methodology proposes the use of the expert opinions based on various management techniques such as brainstorming and nominal group discussion technique in developing the contextual relationship between the various factors of trust. Initially, a group of expert people with required knowledge, skills, and backgrounds is selected. This group should consist of experts from different areas with a wide-ranging skill-set.

For this study, there were 10 experts from industry who were interviewed to analyse the relationship between the various factors. Out of 10, four were project managers and six were team members in their respective virtual project teams. These experts were having varied range of experience starting from oil and gas sector to EPC projects.

For the purpose of this demonstration, the word "facilitate" is chosen to establish contextual relationships within the factors. This means that a particular factor facilitates another factor. On the basis of this, contextual relationship between the factors is developed.

Following four symbols were used to denote the direction of relationship between the factors of trust in virtual project teams of construction sector.

V: Factor *i* facilitates factor *j*.

A: Factor *j* facilitates factor *i.*

X: Factor *i* and *j facilitates* each other.

O: Factor i and j are unrelated.

The discussions with the experts helped in identifying the relationships between the identified factors of trust. The experts were asked to compare the column statement with the row statement for each cell and to choose a value from the set (V, A, X, or O) to represent their perception of direct relationship between two factors at each time. On the basis of contextual relationship between factors, the SSIM has been developed. Final SSIM is presented in Table 8.1

Table8.1. Structural Self-Interaction Matrix (SSIM)

Factors of Trust		**1**	**2**	**3**	**4**	**5**	**6**
Organizational culture of the company	**1**		O	V	O	A	V
Diversity of the team members.	**2**			V	A	V	A
Degree of communication within the team.	**3**				A	A	X
Team Members' characteristics	**4**					V	V
Conflict within the team	**5**						X
Cohesion of the team	**6**						

8.2.3 Development of the initial and final reachability matrix:

The next step is to develop the initial and final reachability matrix from the SSIM.

8.2.3.1 Initial reachability matrix

The initial reachability matrix is obtained from the SSIM format by transforming the information of each cell of SSIM into binary digits (i.e., 1s or 0s). This transformation has been done by substituting V, A, X, O by 1 and 0 as per the following rules. Rules for transformation are given in Table 8.2.

Table8. 2. Rules for transformation

	Entry in the initial reachability matrix	
If the (*i*, *j*) entry in the SSIM is	**(*i*, *j*)**	**(*j*, *i*)**
V	1	0
A	0	1
X	1	1
O	0	0

Following these rules, initial reachability matrix is prepared as shown in Table 8.3.

Table8.3. Initial Reachability Matrix

Factors of Trust		**1**	**2**	**3**	**4**	**5**	**6**
Organizational culture of the company	**1**	1	0	1	0	0	1
Diversity of the team members.	**2**	0	1	1	0	1	0
Degree of communication within the team.	**3**	0	0	1	0	0	1
Team Members' characteristics	**4**	0	1	1	1	1	1
Conflict within the team	**5**	1	0	1	0	1	1
Cohesion of the team	**6**	0	1	1	0	1	1

8.2.3.2 Final reachability matrix

To get Final reachability matrix, the concept of transitivity is introduced, and some of the cells of the initial reachability matrix are filled in by inference. If a variable *'i'* is related to *'j'* and *'j'* is related to *'k'*, then transitivity implies that variable *'i'* is necessarily related to *'k'*. The final reachability matrix is developed after incorporating the transitivity concept in Table 8.3 and is presented in Table 8.4 wherein entries marked ***** show the transitivity.

Table8. 4. Final Reachability Matrix

Factors of Trust		**1**	**2**	**3**	**4**	**5**	**6**	**Driving Power**
Organizational culture of the company	**1**	1	1*	1	0	1*	1	5
Diversity of the team members.	**2**	1*	1	1	0	1	1*	5
Degree of communication within the team.	**3**	0	1*	1	0	1*	1	4
Team Members' characteristics	**4**	1*	1	1	1	1	1	6
Conflict within the team	**5**	1	1*	1	0	1	1	5
Cohesion of the team	**6**	1*	1	1	0	1	1	5
Dependence Power		5	6	6	1	6	6	**30**

In this table, the driving power of a particular source is the total number of factors (including itself) that it influences. The dependences is the total number of factors (including itself) that it may help influencing its growth. These driving power and dependency values will be used in classification of trust factors (MICMAC analysis).

8.2.4 Level partitioning the final reachability matrix:

After creating the final reachability matrix, a series of partitions are presented (Warfield, 1974) which are induced by the reachability matrix on the set and subset of different variables. From these partitions one can identify many properties of the structural model. The reachability and antecedent set (Warfield, 1974) for each factor are obtained from final reachability matrix. The reachability set for a particular factor consists of the factor itself and the other factor, which it influences. The antecedent set consists of the factor itself and the other factor, which may influence it. Subsequently, the common factor of the reachability and antecedent sets form the intersection set. When the reachability set and intersection set are same, it is assigned as the top-level element in the ISM hierarchy. The top-level factors are those that will not lead the other factors above their own level in the hierarchy. Once the top-level factor is identified, it is eliminated from further hierarchical analysis and other top-level factors of the remaining sub-group are identified. This iteration is repeated till the levels of each

issue are determined (Tables 8.5 to 8.7). The identified levels aids in building the digraph and the final model of ISM.

Table 8.5: Iteration 1(Level Partitioning)

Level Partitioning- Iteration 1				
Factors of Trust	**Reachability Set**	**Antecedent set**	**Intersection**	**Level**
F1: Organizational culture of the company	1,2,3,5,6	1,2,4,5,6	1,2,5,6	
F2: Diversity of the team members.	1,2,3,5,6	1,2,3,4,5,6	1,2,3,5,6	I
F3: Degree of communication within the team.	2,3,5,6	1,2,3,4,5,6	2,3,5,6	I
F4: Team Members' characteristics	1,2,3,4,5,6	4	4	
F5: Conflict within the team	1,2,3,5,6	1,2,3,4,5,6	1,2,3,5,6	I
F6: Cohesion of the team	1,2,3,5,6	1,2,3,4,5,6	1,2,3,5,6	I

Table8. 6: Iteration 2(Level Partitioning)

Level Partitioning- Iteration 2				
Factors of Trust	**Reachability Set**	**Antecedent set**	**Intersection**	**Level**
F1: Organizational culture of the company	1	1,4	1	II
F4: Team Members' characteristics	1,4	4	4	

Table8.7: Iteration 3(Level Partitioning)

Level Partitioning- Iteration 3				
Critical success factors	**Reachability Set**	**Antecedent set**	**Intersection**	**Level**
F4: Team Members' characteristics	4	4	4	III

Final list of Level Partitions is given in Table 8.8.

Table 8.8: Final List of Partitions

Level	**Factor No.**	**Factor name**
I	F2	Diversity of the team members.
	F3	Degree of communication within the team.
	F5	Conflict within the team
	F6	Cohesion of the team

II	F1	Organizational culture of the company
III	F4	Team Members' characteristics

The identified levels aids in building the final model of ISM. First level factors are positioned at the top of model and so on.

8.2.5 Building the ISM-based model

From the final reachability matrix, the hierarchical model is generated. If a relationship exists between the two factors i and j, it is depicted by an arrow pointing from i to j. In this model, the top level factor is positioned at the top of the diagraph and second level factor is placed at second position and so on, until the bottom level factor is placed at the lowest position in the diagraph. Diagraph is finally converted into ISM after removing the transitive links as shown in figure 8.1.

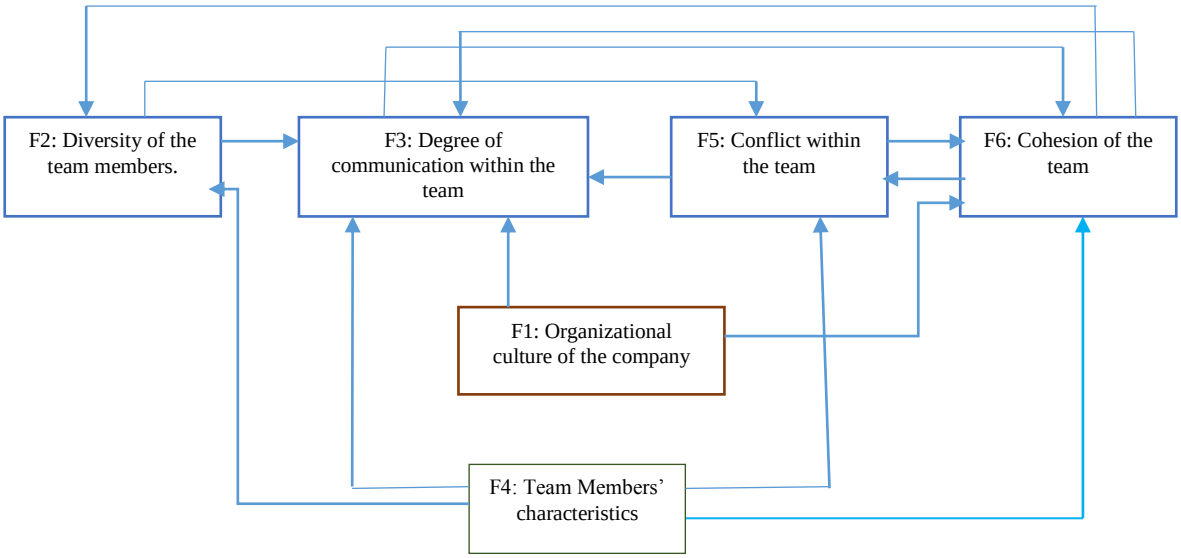


Figure 8.1: An ISM based model of factors to trust building in virtual project teams in construction sector of Middle East

8.2.6 Discussion on ISM Model:

The factors of trust building within virtual project teams in construction sector of Middle East pose substantial challenge for Project Managers, Middle management as well as the Top management of the construction companies. The ISM model highlights the major factors of trust and provides a means for analysing the interaction between these factors. These factors are essential for the success of virtual project teams, and contribute in increasing the productivity of the companies. The ISM model

shown in figure 8.1 and the driver power- dependence diagram shown in figure 8.2 provide valuable insights into the factors of building trust in virtual project teams, and their relative importance and interdependence.

Lowest Level Factors and their Relationships: The ISM model shows that characteristics of team members such as ability, integrity , benevolence, competence, reliability and professionalism are the most significant factors for building trust in virtual team members. The ability of the team members indicates the skills and competencies required for effective communication within the team , hence affecting the communication structure of the team. Integrity of the team members enables other team members to believe each other as it is assumed that trustee is believed to follow principles and guidelines that are accepted by trustor. The integrity of team members leads to the cohesion among the team members as it greatly motivates the trust among the team members. However, the violation of integrity characteristic leads to conflict within the team. The benevolence deals with interpersonal cares and concern and the willingness to help others by keeping aside the egocentric profit motive. With these characteristics, it helps in building up the team, no matter how much diversity is there in the team. As the virtual teams handles multiple tasks at a time which are highly interdependent, the team member characteristics helps in information sharing. This greatly reduces the conflict among the team members helping the teams to achieve their goals. Therefore, the team members' characteristics plays a great role in enhancing the communication and cohesion within the team and reducing the conflict irrespective of the diversity of the team. However, it does not have any role to play in enhancing the organizational culture of the company. It does not get affected by the changes in organizational culture of the company as team members' characteristics are inbuilt characteristics which gets changed very occasionaly due to external factors.

Middle Level Factors and their Relationships: The organizational culture of the company consists of many elements such as clear objectives and goals, recruitment strategy, rewards of the team members, fair policy of team evaluation, mentoring of the team members and degree of task interdependence. It stands at the second level of ISM hierarchy. It is stated that if the team members are made clear of their objectives and goals at the beginning of the creation of virtual teams, this helps in a great deal in

acheiving the goals of the organization. Goal setting improves the trust of the team members as it stretches the intensity and persistence of the team members by enabling them channelize their behaviour towards improved work performance. It effects the communication within the team by acting as the motivational factor for the team members. The companies at the same time needs to be very focussed while recruiting the candidates for the virtual project teams. The selection criteria of an organization affects the type of people that will be in teams. Failing to attain the right kind of people in the teams leads to conflicts at the later stages of the projects. The fair policy of team evaluation reduces the friction among the members of the team thus building strong bonding within the team members. Whereas the relationship conflict within the team spoils the organizational culture of the company,and the task based conflict increases the creativity and productivity of the team. Therfore the organizational culture of the company increases the communication within the company and cohesion among the team members but gets affected by the relationship conflicts of the team members.

Top Level Factors and their Relationships: The diversity of the team members, communication among the team members, conflict with in the team and cohesion of the team form the top level of the hierarchy. The factors at this level are dependent on other issues for their existence. The diversity of the team effects the communication of the team as the members belong to diverse cultures and the nature of communication differs from one culture to another. For example: Japanese prefer detailed and thorough explaination for any kind of issue whereas Americans always perfer prompt replies. The diversity also affects the cohesion of the team in a way that if the team is short lived, the diverse culture negatively effects the cohesion of the team as there is no time to have bonding within the team. The communication positively effects the cohesion as the more the communication happens within the team, more is the bonding within the team. This results in better collaboration within the team , which is very much required as the teams are geographically dispersed. The effective use of communication, especially during the early stages of the team's development, plays an important role in gaining and maintaining trust. The conflict within the team decreases the bonding between the team members and also results in less communication among the team members. This happens when the conflicts

becomes relationship and personal based and its frequency increases with time. On the other hand , if the team is strongly knitted together, it greatly increases the communication within the team thus increasing the trust building within the team, no matter how much diverse the team is.

The factors at this top level does not exists on its own. They are being affected by the organizational culture and the characteristics of team members as discussed in the middle level factors.

Thus the ISM model brings out the most important factors which are needed to be thought by the project managers and top level management to have trust building within the virtual project teams.

8.2.7 'MICMAC' Analysis

MICMAC principle is based on the multiplication of matrix to classify the key factors that drive the system in a variety of categories. The objective of the MICMAC analysis is to analyse the driving power and the dependence of the variables (Faisal et.al., 2006; Mandal, 1994). The dependence and the driving power of each of these challenging issues are given in Table 8.4. In this table, an entry of '1' along the rows and columns indicates the driving power and the dependence, respectively. Subsequently, the driving power-dependence diagram is constructed as shown in Figure 8.2. In this analysis, the factors that effects trust building in virtual project teams in construction sector of Middle East described earlier are classified into four clusters: (i) Autonomous factors, (ii) Dependent factors, (iii) Linkage factors and (iv) Independent factors.

		Cluster 4: Independent Issues					**Cluster 3: Linkage Issues**
Driving Power	6	F4					F1
	5						F2, F5, F6
	4						F3
	3						
	2						
	1						
		1	2	3	4	5	6
		Cluster 1: Autonomous Issues					**Cluster 2: Dependent Issues**
		Dependence Power					

Figure8. 2: Driving Power- Dependence Diagram

8.2.8 Discussion on MICMAC Analysis

Autonomous Cluster: The driving-dependence power diagram as shown in figure 8.2 indicates that there are no autonomous factors in the trust building of virtual project teams. The absence of any factor from autonomous category shows that all the considered factors influence the trust building of virtual project teams in construction sector. Autonomous factors are weak driver power and also weak dependent. The autonomous factors are relatively disconnected from the system, though they have only few links, which may be strong. Hence, they do not have much influence on the system.

Dependent Cluster: This is a dependent quadrant with low driving power and high dependence. They are seen at the top of the ISM hierarchy as shown in figure 8.1, therefore considered as important factors. The management should tackle these factors by understanding the dependence of these factors on lower level of the ISM. According to the present study, Diversity of the team members (F2), Degree of communication of the team (F3), Conflict within the team (F5) and cohesion of the team (F6) are having weak driver power and strong dependence power. This means all these factors need to be addressed for trust building in virtual project teams for effectively handling these factors. The diversity of the team (F2) deals with both functional as well as cultural diversity of the team members. It gets affected by the characteristics of the team members and affects the communication within the team and cohesion of the team. The communication among the team members (F3) gets affected by the team members' characteristics, Conflict within the team and the organizational culture of the company. The conflict within the team members (F5) gets affected by the characteristics of the team members as the violation of integrity of team members' results in conflicts. The conflict in the team is inversely proportional to the cohesion among the team members. The more closer a team is, the less is the conflict between them. This is because the bonding among team members increases the understanding among the team members. The members who do not share information in the team greatly increase the conflict within the team. The cohesion of the team (F6) depends on the kind of conflict happening in the team. The task conflicts relate to differences referring to the tasks executions. These kind of conflict

gets easily resolved in discussions yielding to more productive outcomes. Whereas the relationship conflicts is concerned with interpersonal incompatibilities and typically associated with tension in the team. And it is this relationship conflicts that decreases the cohesion between the team members as it involves ego in the team. It also gets affected by the team member characteristics, diversity of the team and organizational policies of the company. The more diverse teams tend to be less cohesive but they work great in achieving their goals due to alternate solutions of the team members because of their functional diversity. The fair team evaluation and reward structure of organizations increases the trust of team members in the companies and build strong bonding among the team members enabling them to achieve their targets in deadlines.

Linkage Cluster: They have strong driving power and also have strong dependence. Any change occurring to these factors will have an effect on others and also a feedback on themselves. Hence, these factors are unstable in nature which may affect the trust building in virtual project teams of construction sector either in positive or negative way. The organizational culture of the organization (F1) falls into this cluster. It consists of many elements such as clear objectives and goals, recruitment strategy, rewards of the team members, fair policy of team evaluation, mentoring of the team members and degree of task interdependence. It strongly effects the communication within the team and cohesion of the team as it acts as a motivational factor to them by having clear goals and fair policy of team evaluation. It gets affected by the conflict within the team as the relational conflicts strongly disturbs the working culture of the company.

Independent Cluster: This is an independent quadrant which has strong driving power but weak dependence power. The factors in this cluster are treated as a "key enabler". This enabler is placed in the root level of ISM hierarchy as shown in figure 8.1. Therefore, it can be anecdotal that management should work out strategies to facilitate these independent factors for successful trust building in the virtual project teams. These factors possessing higher driving power in the ISM need to be taken care on priority basis because there are few other dependent factors being affected by them. In this study, Team members' characteristics (F4) falls into this category. The characteristics of the team members strongly effects the diversity, communication,

conflict within the team and cohesion of the team as it's the different characteristics of team members which decides the level of trust in the team. As the characteristics of the team members can never be manipulated, it does not have any dependence on any other factor. Thus, it's very important for a project manager to understand the different abilities of team members to channelize them to strong trust building of the team members for better productivity in the company.

Table 8.9 provides the entire summary of clusters and its characteristics.

Table8. 9: Cluster and its characteristics

Cluster No.	Clusters	Characteristics	Driving Power	Dependence Power	Challenging Factors
I	Autonomous	These issues are relatively disconnected from the system, with which they have only few links, which may not be strong.	Weak	Weak	--
II	Dependent	These issues are the automatic followers of other issues.	Weak	Strong	F2,F3,F5,F6
III	Linkage	These issues are unstable, in the sense that any action on these issues will have an effect on others and also a feedback on themselves.	Strong	Strong	F1
IV	Independent	These issues are the key drivers for implementation. Management has to pay maximum attention to these issues to get quick results.	Strong	Weak	F4

8.2.9 Implications of ISM model of trust

The study is associated with the changes required within the construction companies that are associated with the virtual project teams. The implications of ISM Model of trust provide some guidelines to help busy managers to understand the issues involved with the working of virtual project teams. This ISM model of trust addresses the main factors responsible for building trust in the virtual project teams especially in context of the Middle East. It also recognized the various relationships among the various factors of trust building in the Middle East. This largely gives an outline to the project managers of the construction companies to adapt the guidelines and address the complex issue of trust among virtual project teams for enhancing the performance of the virtual project teams.

1. The characteristics of the team members play a great role in the building of trust in the virtual project teams. The project managers are required to make the teams in such a way that the members are having ability, integrity, competence, reliability and professionalism. This is the first and most valuable step in the creation of virtual project teams as the team member characteristics greatly impacts the degree of communication, helps in reducing the conflicts within the team and increases bonding among the team members. Since the members of the teams are from diverse cultures, it becomes more important for the project managers to have team members with the required characteristics so that the trust among the team members remain intact and helps in increasing the performance of the team.
2. Next the senior management of the construction companies is required to see that each member of the team is aware of the objectives and goal of the virtual project teams. If the team members are not clear of what is expected from them, it is very difficult for the teams to achieve the goals of the organization.
3. The companies also require to have a strong policy towards the recruitment of right kind of people for the projects. The selection criteria of the company greatly affect the kind of people in the teams.
4. The management also needs to have a fair policy of team evaluation. Since the virtual project teams are geographical dispersed, it's the management role to see that they do not feel left out. It is always believed by the team members, as understood from the literature also, that the teams stationed at head office gets more priority as their work gets noticed clearly.
5. The project managers are required to focus on the mentoring of the teams during the initial phases of the team creation. This is primarily because the teams are from diverse cultures, the communication among the team members gets greatly affected by the diversity of the team members. So the initial kick-off meetings are of great help to resolve preliminary issues of team building.
6. Next, since the virtual project teams are at different locations and are dispersed in nature, the middle level management is required to provide teams with right kind of tools for communication. They need to see that the teams get latest technology software with respect to engineering and design.

7. Also it's very important for the management to have team building exercises within the teams to break the ice among the members of the teams. The teams should be provided with trainings on conflict management, improving interpersonal and management skills. The team members should be sent to these kind of trainings from one location to another location so that it helps in building confidence in other members of the dispersed teams and builds the trust among them. This largely helps them to share information among each other for the execution of various projects.

Therefore, the ISM model of trust gave insights to project managers, Middle and Senior management about the structured relationships between the various factors of trust building in the virtual project teams. This technique demonstrated the systematic nature of the factors of trust building of virtual project teams encouraging the adoption of virtual project teams in construction companies.

8.3 Interpretive Ranking Process(IRP)

IRP is a novel ranking method that combines and uses the strength of both the logic choice process with the intuitive process of decision-making. It builds on the strength of a pair-wise comparison approach which minimizes the reasoning overload. It also relies on an interpretative matrix as a basic tool and paired comparison of interpretation in the matrix to generate the ranking model. The IRP method presents clearly the interpretive logic of the decision as the expert is supposed to spell out the interpretive logic for dominance of one element over the other for each pair-wise comparison. This logic is usually documented on the knowledge base for future use by decision makers. It makes an internal validity check via the vector logic of the dominance relationships by developing a dominance system graph.

The IRP methodological steps as documented by Sushil (2009) are outlined:

- Identify the two sets of variables- one to be ranked with reference to the other, e.g. Alternatives and Criteria, Actions and Performance, Actors and Processes, and so on.
- Clarify the contextual relationship between the two sets of variables.
- Develop the cross-interaction binary matrix between the two sets of variables.

- Convert the Binary matrix into an interpretive matrix (Sushil, 2005) by interpreting the interactions.
- Convert the Interpretive matrix into an interpretive logic of pair-wise comparisons and Dominating interactions matrix by interpreting the dominance of one interaction over the other.
- Develop ranking and interpret the ranks in terms of dominance of number of interactions.
- Validation of ranks derived.
- Displaying ranking diagrammatically in the form of an 'Interpretive Ranking Model'.
- Decision about ranks with interpretation and recommendation for action.
- Knowledge management for further use.

Based on the statistical analysis of data through IBM SPSS software and by using structural equation modelling (IBM AMOS Ver22), the researcher have created a model of trust which constitutes various factors affecting it either positively or negatively. The different factors which affect the trust within virtual project teams came out to be

a) Organizational culture of the company
b) Diversity of the team members.
c) Degree of communication within the team.
d) Team Members' characteristics
e) Conflict within the team
f) Cohesion of the team

IRP uses two set of variables. One set of variables that are to be ranked, in this case the factors that affect the trust within the team and the other set of reference variables that provide the basis for ranking, in this case the benefits of trust (Haleem et al., 2012). Based on inputs from industry experts, four key benefits of trust have been used in this study that include Improved performance of the team (P1), Better Collaboration within team (P2), Sharing of knowledge (P3) and Faster Execution with minimized delays(P4) as discussed in Chapter 7 as well.

8.3.1 Cross-Interaction Matrix: A cross-interaction matrix shows the existence or nonexistence of contextual relationship between each Factor and benefits of trust. Numeric '1' defines a presence of relationship exist and '0' defines its absence. The cross-interaction matrix is developed after taking inputs from industry experts and shown in Table 8.10.

Table8.10. Cross interaction matrix for the identified Factor

Factors	**Benefits of Trust within the team**			
	P1: Improved Performance of the team	**P2:** Better collaboration within team	**P3:**Sharing of knowledge	**P4:**Faster execution with minimized delays
F1: Organizational Culture	1	1	1	1
F2: Diversity of the team	1	0	1	0
F3: Communication within the team	1	1	1	1
F4: Characteristics of Team members	1	1	0	1
F5: Conflict in the team	1	0	0	0
F6: Cohesion of the team	1	1	1	1

8.3.2 Interpretive logic matrix: This matrix displays the conversion of the cross interaction binary matrix into an interpretive matrix becoming the basic data needed for comparison for the purpose of ranking the Factor (see Table 8.11). This means interpreting all interactions with entry '1' in terms of contextual relationship. This was made possible by consolidating the views of professionals from construction sectors of Middle East.

Table 8.11: Interpretive logic matrix

Factors	**Benefits of Trust within the team**			
	P1: Improved Performance of the team	**P2:** Better collaboration within team	**P3:**Sharing of knowledge	**P4:**Faster execution with minimized delays
F1: Organizational Culture	By providing clearer role perceptions and goal setting.	By providing reward structures which encourages cooperative efforts of the team rather	By recruiting the team members with necessary skills.	By scheduling deadlines and coordinating the pace of effort within the team.

		than competitive effort within its members.		
F2: Diversity of the team	Results in variety of perspectives and solutions.	0	Brings in lot of experience and assists in sharing.	0
F3: Communication within the team	Through effective communication of project plan and having a defined communication structure.	Helps in reducing the differences in perceptions of team members.	Assists by providing various latest tools.	By reducing time delays in sending information and feedback.
F4: Characteristics of Team members	Through the necessary skills, competencies, and abilities within a team.	Integrity of team members is considered as trustworthiness in a trusting relationship.	0	Team is well equipped with necessary skills for faster executions for meeting deadlines.
F5: Conflict in the team	Task conflicts are considered good as they generate different ways of completing a task.	0	0	0
F6: Cohesion of the team	Creates a sense of satisfaction while working together and a commitment of keeping the group together.	Aids in developing more positive attitude towards team members.	Helps in increasing liking or affinity for the people in the team and the desire to work together for achieving the common goal.	Acts as the emotional investment in trust relationships with people expressing genuine care and concern for the welfare of the team members.

8.3.3 Pair-wise Comparison*:* The interpretive matrix is used as a base to pair compare the ranking variables w.r.t. the reference variables one by one to make comparison table as shown in table 8.12. In this, the ranking variables are not directly compared; rather their interactions w.r.t. the respective reference variables are compared (Sushil, 2009).

Table 8.12: Interpretive Logic- Knowledge Base- Ranking of Factors w.r.t. Benefits of trust

Paired comparison	***Interaction with Benefits of Trust***	***Interpretive logic***
F1 dominating F2	P2, P4	F2 has no direct role.
	P1	F1 has more influence than F2 in this performance area.
F1 dominating F4	P3	F4 has no direct role.
F1 dominating F5	P2,P3,P4	F5 has no direct role.
F1 dominating F6	P4	F1 has more influence than F6 in this performance area.
F1 dominating F3	P1	F1 has more influence than F3 in this performance area.
F2 dominating F4	P3	F4 has no direct role.
F2 dominating F5	P1	F2 has more influence than F5 in this performance area.
	P3	F5 has no direct role.
F2 dominating F6	P1	F2 has more influence than F6 in this performance area.
F3 dominating F1	P2	F3 has more influence than F1 in this performance area.
F3 dominating F2	P2,P4	F2 has no direct role.
F3 dominating F4	P3	F4 has no direct role.
	P4	F3 has more influence than F4 in this performance area.
F3 dominating F5	P2, P3,P4	F5 has no direct role.
F3 dominating F6	P4	F3 has more influence than F6 in this performance area.
F4 dominating F1	P2	F4 has more influence than F1 in this performance area.
F4 dominating F2	P2, P4	F2 has no direct role.
F4 dominating F5	P2,P4	F5 has no direct role.
	P1	F4 has more influence than F5 in this performance area.
F6 dominating F1	P3	F6 has more influence than F1 in this performance area.
F6 dominating F2	P2,P4	F2 has no direct role.
F6 dominating F4	P3	F4 has no direct role.
F6 dominating F5	P2, P3,P4	F5 has no direct role.

8.3.4 Dominating Interaction Matrix: All the dominating interactions are summarized in the 'Dominating Interactions Matrix' as shown in table 8.13.

Table 8.13 Dominating interaction matrix

Dominating ⟶

Being Dominated ↓

	F1	F2	F3	F4	F5	F6
F1	--	P1,P2,P4	P1	P3	P2,P3,P4	P4
F2	--	--	--	P3	P1,P3	P1
F3	P2	P2,P4	--	P3,P4	P2,P3,P4	P4
F4	P2	P2,P4	--	--	P1,P2,P4	--
F5	--	--	--	--	--	--
F6	P3	P2,P4	--	P3	P2,P3,P4	--

8.3.5 Dominance matrix: The numbers of dominating interactions are summarized in the form of a dominance matrix as shown in table 8.14, which gives the number of cases in which one ranking variable dominates or being dominated by other ranking variable. The sum of the rows gives the total number of cases in which a particular ranking variables dominates all other ranking variables. The sum of a column indicates the total number of cases in which a particular ranking variable is being dominated by all other ranking variables. The difference of number dominating in column 'D' and the corresponding number being dominated in row 'B' gives the net dominance for a ranking variable. The positive net dominance would mean that the concerned variable has more numbers dominating than being dominated, whereas the net negative dominance would imply that the concerned variable is being dominated in more number of cases than dominating other variables. The variable having net positive dominance in maximum number of cases is ranked I followed by lower number of dominance relationships. The variables with negative net dominance will be ranked lower as these are being dominated more by other variables. The sum of all net dominances for various variables should come out to be zero. This can be used as a cross-check to validate the dominance relationships (Sushil, 2009)

Table 8.14: Dominance Matrix

	F1	**F2**	**F3**	**F4**	**F5**	**F6**	**No. Dominating (D)**	**Net Dominance (D - B)**	**Rank Dominating**
F1	--	3	1	1	3	1	9	6	II
F2	--	--	--	1	2	1	4	-5	V
F3	1	2	--	2	3	1	9	8	I
F4	1	2	--	--	3	--	6	1	IV
F5	--	--	--	--	--	--	0	-14	VI
F6	1	2	--	1	3	--	7	4	III
No. being Dominated (B)	3	9	1	5	14	3	35 **(Total Interactions)**	0	

8.3.6 Interpretive Ranking Model (IRM): The ranks obtained from the dominance matrix are presented in a diagram known as the IRM as shown in figure 8.3. This model displays the final rankings of the factor with respect to the benefits of trust within a virtual project team members. The IRM displays how each factor is influencing the various benefits of trust within the team. For all the challenges of trust building, the numbers dominating and numbers being dominated were summarized within brackets. This model will be helpful in developing the trust within the virtual project teams to enhance the benefit areas which are the ultimate goal for companies.

LEGEND

P1 IMPROVED PERFORMANCE OF THE TEAM

P2 BETTER COLLABORATION WITHIN TEAM

P3 SHARING OF KNOWLEDGE

P4 FASTER EXECUTION WITH MINIMIZED DELAYS

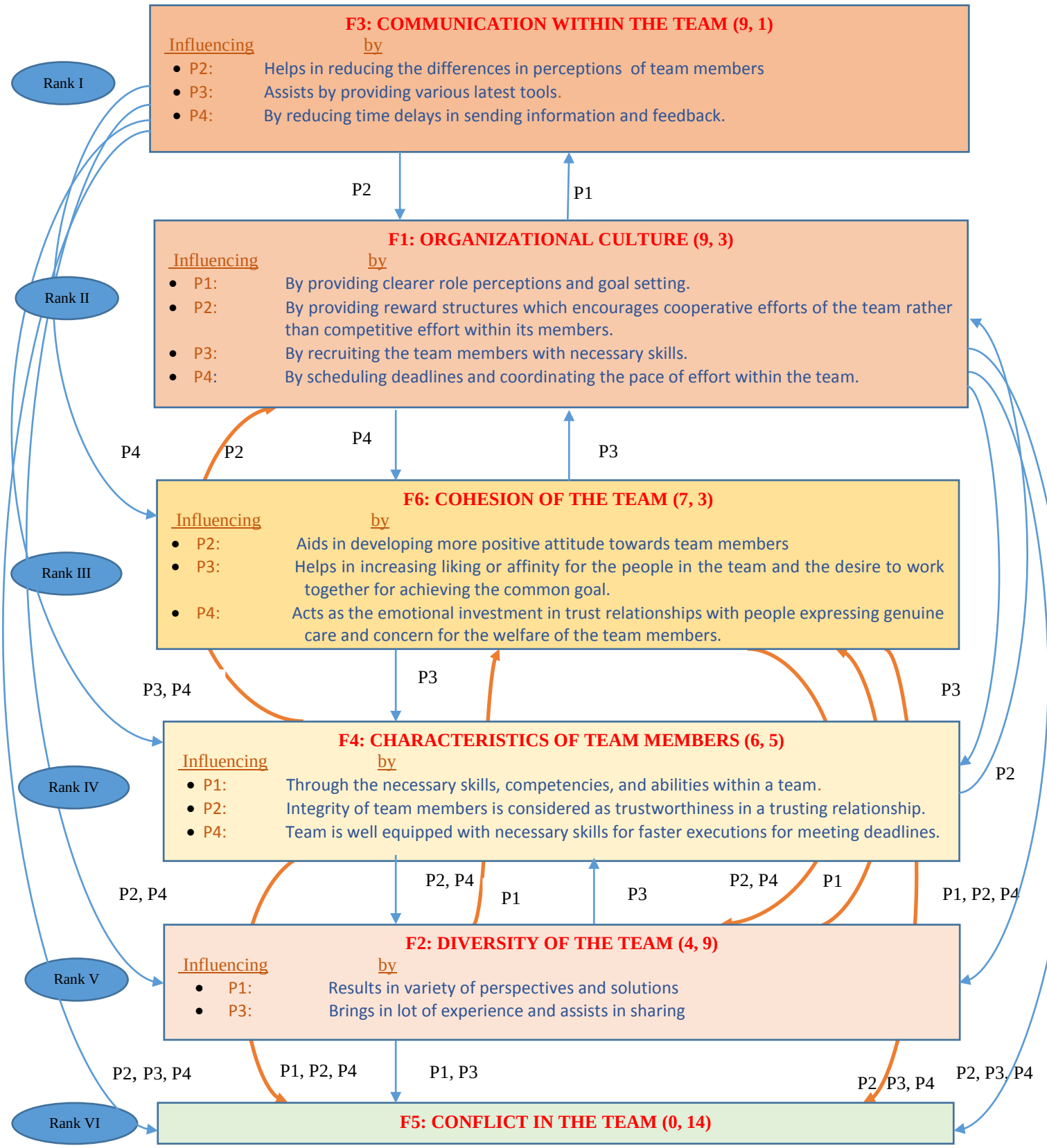


Figure 8.3: Interpretive Ranking Model

8.3.7 Discussion on Interpretive Ranking Process Model

From the IRP model in figure 8.3, the following interpretations can be made on the various factors of trust building with respect to the benefits of the trust.

RANK 1: COMMUNICATION WITHIN THE TEAM: The communication within the team (F3) has proved to be an important factor of trust building that influences the benefit areas of Better collaboration of the team (P2), Sharing of information (P3) and faster execution with minimized delays (P4). As per studies by Carvalho (2008), the main barriers to communicate in a project are the differences in perception and lack of communication plan.

The degree of communication facilitates better collaboration (P2) by helping the diverse teams in reducing the differences in perceptions of the team members. The effectiveness of virtual teams highly depends upon the satisfaction of team members. The most satisfied team members are those with effective coordination and communication. According to the studies done by Bryant, Albring & Murthy (2009), the team member's satisfaction is higher when a rich technology medium is used. Therefore communication develops satisfaction among the team members which helps team members to better collaborate with the team and to develop more positive interpersonal relationships.

The very nature of communication greatly enhances the sharing of knowledge (P3) by providing the team members with the latest tools of communication. The characteristics of communication technology contribute to the team conflict. The richness of communication medium facilitates the knowledge sharing among teams. The more effective their knowledge sharing is, the better they can perform their tasks. The context or internal environment of project teams in terms of the communication influences individual's willingness to share knowledge with other members.

According to Crampton (2001), the virtual environment poses considerable challenges to effective communication including delays in sending feedback and assurance of participation from remote team members. As the work in construction industry is

distributed in nature with team members working in different time zones, there needs to have faster information exchange. The degree of communication dictates fairly well in influencing faster execution of projects with minimized delays (P4) by assisting the team members in reduction of time delays in sending information and feedback.

Dominance Relationships:

- The communication within the team (F3) dominates the organizational culture of the company (F1) with respect to better collaboration of the team (P2) by reducing the differences in perceptions of the team members regarding the executions of the projects.
- It governs diversity of the team (F2) in better collaboration within team (P2) and faster execution of the projects (P4) by reducing the misunderstandings of the diverse cultured team members and decreasing the time delays in sending the information and feedback to the teams.
- It has got more power than Characteristics of team members (F4) in increasing the sharing of knowledge (P3) and faster execution of projects (P4) by assisting the teams through latest communication tools.
- It controls Conflicts in the team (F5) in the benefit areas of Better collaboration within the team (P2), sharing of knowledge (P3) and faster execution of the projects (P4) as F5 has no role in enhancing these areas of benefits.
- It has got more command on cohesion of the team (F6) in the benefit area of faster execution of the projects (P4) as F6 leads to emotional component in the teams whereas F3 acts strongly on the nature of communication which results in shorter delays of replies needed for faster execution of the projects.

RANK 2: ORGANIZATIONAL CULTURE OF THE COMPANY: The organizational culture of the company (F1) is at rank 2 and influences improved performance of the team (P1), Better collaboration within the team (P2), Sharing of Knowledge (P3) and faster execution with minimized delays (P4). The organizational culture includes norms regarding the flow of information and cross boundary collaborations. The organizations must provide appropriate physical, financial and social support.

The organizational culture (F1) influences improved performance of the team (P1) by providing clearer roles and goal setting to the team members. As per Massey et al., (2003), the lack of visibility may cause virtual team members to feel less accountable for results. The goal setting greatly improves the performance by stretching the intensity and persistence of team members' effort and by giving them, clearer role perceptions to enable them channel their behaviours' towards improved work performance.

Also the reward structure greatly enhances the collaboration in the team (P2) as it encourages cooperative efforts of the team. Bal and Gundry (1999) and Naha, Mansor & Mirahsani (2012) also proposed that teams perform better when the reward is based on individual and team performance. The project managers can appreciate the team members in company newsletters, inscribing team's name on T-shirts , mugs or monetarily to give the team members a sense of identity These kind of gestures greatly improve performance of the team as it motivates the team towards a common goal.

The team selection is a key factor which differentiates successful teams from unsuccessful ones. The organizational culture benefits the sharing of knowledge (P3) by recruiting the team members with necessary skills pertaining to a particular project. The HR manager needs to see that the team member not only possess the required technical skills but also they should have good interpersonal skills. This is very much required as much is dependent upon the behaviour of an individual. There needs to be interpersonal care and concern, the willingness to do good to the trustor aside from an egocentric profit motive.

The faster execution of the project (P4) greatly depends on organizational culture as it schedules deadlines and coordinate the pace of effort of the team to increase vigilance and accountability. The fair policies of team evaluation for these dispersed virtual project teams motivate the team members to collectively work together for the faster executions of the projects.

Dominance Relationships:

- The organizational culture of the company dominates the diversity of the team (F2) in the benefit areas of improved performance of the team (P1), better collaboration within the team (P2) and faster executions of projects (P4). For P2 and P4, the diversity of the team members plays no role but for P1, the organizational culture provides the teams with clear and focussed understanding of their roles and gives them a sense of responsibility for their work.
- It overshadows the communication within the team (F3) in the benefit area of improved performance of the team (P1) by providing the team members clearer role and goal setting to the team members which helps in increasing the performance of the teams.
- It has more command over characteristics of the team (F4) and conflict within the team (F5) in the benefit areas of P3 and P2, P3 and P4 respectively. This is primarily because F4 and F5 does not play any role in these benefit areas of trust.
- It influences cohesion of the team (F6) in the benefit area of faster execution of the projects (P4) by scheduling the deadlines and coordinating the pace of work within the teams whereas F6 handles P4 by providing genuine care and attachment within the teams.

RANK 3: COHESION OF THE TEAM: The rank 3 deserves to have factor as cohesion of team (F6) which influences Better collaboration of the team (P2), Sharing of knowledge (P3) and faster execution of the projects (P4).

The collaboration within the team (P2) can be achieved when there is a positive attitude towards each other in a virtual project team. This positive attitude comes with feeling of respect towards other team members. As the teams are short lived, sometimes swift trust develops to complete the task within stipulated deadline.

The cohesion of the team also affect the sharing of knowledge (P3) by increasing liking or affinity for the people in the team and the desire to work together for achieving the common goal. The cohesion in the team is believed to increase emotional bond and sincere concern for the well-being of the others. The cohesion is

strongly needed for the exchange of information which is very important for the completion of the projects.

The bonding among the team members also affects the faster execution of the projects (P4) and assists in reduction of the delay. It does so as it increases the emotional investment in trust relationships with people expressing genuine care and concern for the welfare of the team members. Amah et al. (2013) also proposed that employees who like working and achieving in a group will do better as team members than those who like and achieving alone. Therefore the cohesion of the team helps to achieve the team satisfaction and performance by building trusting relationships among the team.

Dominance Relationships:

- The cohesion of the team (F6) dominates the organizational culture of the company (F1) in the benefit area of sharing of knowledge (P3) as it increases the affinity for the people in the team and the desire to work together for achieving the common goal.
- It reigns the diversity of the team (F2) in the benefit area of better collaboration within the team (P2) and faster execution of projects with minimized delays (P4) as F2 does not have any direct role to play in these areas and cohesion of the team helps in achieving P2 by developing positive attitude towards team members and for P4, it acts as an emotional investment in trust relationships within the teams.
- It has more power than Characteristics of the team members (F4) in the benefit area of sharing of knowledge (P3) as F4 has no direct role to play in this benefit area.
- It governs Conflicts in the team (F5) in the benefit areas of P2, P3 and P4 as F5 does not have any role to play in enhancing these benefit areas of trust building in the virtual project teams.

RANK 4: CHARACTERISTICS OF THE TEAM MEMBERS: The characteristics of the team members (F4) happened to come at rank 4 in the IRP model. It influences improved performance of the team (P1), Better collaboration within the team (P2) and faster execution of the projects (P4).

The performance of team (P1) gets heightened when the team members possess necessary skills and competencies required for the particular project. The ability of the team members also enable the team member to be perceived as competent within specific domain.

The integrity of the team members plays a greater role in the better collaboration within the team (P2). The integrity is considered as a quality which is commonly considered a trustworthiness in a trusting relationship (Mayer et al., 1995). Also the integrity of project manager and his zero tolerance to violation of commonly set ethical principles leads to better collaboration in the teams. As the virtual projects are highly complex in nature with teams spreading across globe, the integrity of the team members is considered as the important characteristics of team members due to confidentiality required at certain points in the executions of the projects.

The tasks in the virtual project teams are highly correlated which involves teams to have higher degree of interaction. The necessary skills and competencies of the team members across the teams to share information increase the possibility for the faster execution of the projects (P4). The reduction in delays of the project is attributed to the team members' willingness to interact with each other.

Dominance Relationships:

- The characteristics of team members (F4) dominates Organization culture of the company (F1) in the benefit area of better collaboration within team (P2) as F4 provides integrity of the team members are considered as trustworthiness in a trusting relationships which is required for good team work.
- It influences diversity of the team members (F2) in the benefit area of better collaboration within the team (P2) and faster execution of the projects (P4) as F2 does not play any direct role in P2 and P4.
- It controls conflict with in the team (F5) in the benefit areas of improved performance of the team (P1), better collaboration within the team (P2) and faster execution of projects (P4) with minimized delays as F5 does not have any role in enhancing P2 and P4. F4 achieves P1 more than F5 because F4 deals with

competencies, professionalism and abilities of team members which is more powerful than the task conflicts.

RANK 5: DIVERSITY OF THE TEAM: The rank 5 of the IRP model boosts the diversity of the team (F2) as a challenge to trust building. It influences improved performance of the team (P1) and sharing of information (P3). The diversity of the teams may bring in the situations where the parties of interest are dissimilar with respect to some attributes. The functional diversity of the team greatly contributes to the improved performance of the team (P1) by having the team members who have worked in varied range of functional assignments. This brings in lot of experience of various team members on a common platform which gives new ideas to solve different problems in a project. Also the sharing of information (P3) gets an incremental increase as the diversity brings in exchange of multiple perspectives on issues related to the execution of the projects.

Dominance Relationships:

- The diversity of the team dominates characteristics of team members (F4) in the benefit area of sharing of knowledge (P3) as F4 does not have any role to play in this area.
- It governs conflicts in the team (F5) in the areas of improved performance of teams (P1) and sharing of knowledge (P3). F5 has no direct role in P3 and as F2 improves performance of teams (P1) by providing variety of perspectives and solutions to the projects, it dominates F5 in this area.
- It influences cohesion of the team (F6) in the area of improved performance (P1) because diversity brings in varied expertise in the team and helps in increasing the throughput of the projects.

RANK 6: CONFLICT WITHIN THE TEAM: The conflict within the team (F5) is at rank 6 and does not contribute to any benefit areas of trust.

In summary, the relationships which are developed between the factors of trust building in virtual project teams and various benefit areas using the IRP technique can

be considered as a novel approach, contributing towards the development of virtual project teams in construction sector of the Middle East.

8.3.8 Implications of IRP model of trust

This study contributed to the virtual project teams' literature of construction sector of the Middle East by ranking the different factors of trust building needed for the virtual project teams with reference to the key benefits areas to indicate which factors have the leading role in delivering the various benefits to the companies. This ranking is obtained by using the IRP technique that is new to the construction and research area. In order to achieve the key benefit areas of trust building in the virtual project teams, there are some implications of this IRM model of trust as listed below:

1. The project managers are required to focus on the improvement of the communication within the teams as it greatly enhances the collaboration of the team by sharing of knowledge among the team members and thereby results in faster execution of the projects with minimized delays. They can achieve this by providing the team members with the latest communication tools and relevant trainings.
2. The organizational culture of the companies is at rank 2 and provides guidelines to the senior management in enhancing performance, knowledge sharing, better collaboration and faster execution of projects with minimized delays. The management needs to focus on their team evaluation and reward strategies which enhance cooperative efforts of the team rather than the competitive one. The senior management needs to give the team members a clear role description of their goals and also needs to schedule deadlines depending upon the raw materials and effort required for the execution of the projects.
3. The project managers are required to see that there should be some bonding between the team members as it greatly helps in achieving the better collaboration, knowledge sharing and faster executions of the projects. They need to work on initial kick-off meetings and some team building exercises within the teams. This greatly results in the positive attitude among the team members thus increases the benefits of trust.

4. Again the senior management needs to be very careful in recruiting the right kind of people required for the projects as the characteristics of team members influences the performance of the team, collaboration within the team and faster execution of the team. The team should have mix of high experienced people and some fresher too. The highly experienced people are required to analyze the complex situations of the project and to make right strategic decisions at different times whereas the fresher are needed as they adapt easily to the latest technologies and software.
5. Also as the virtual project teams are geographically dispersed, there is great possibility that teams are having people across the world for different tasks of the projects. Therefore the project manager needs to see that the diversity needs to bring in the varied expertise and perceptions for the problems of project executions. This diversity of team members helps in achieving better performance of the team and results in faster executions of the projects.
6. In context of the Middle East, the conflict within the teams happen only in terms of task based conflicts and does not result in relationship conflicts. The task based conflicts always results in alternate solutions to the problems and are considered as important for the team. The relationship conflicts are always at minimal level as the people here have come to earn money and are well aware they are going to face diverse cultures.

8.4 Summary

This Chapter was built on Chapter 7 where factors challenging the building of trust in virtual project teams were discussed from the participants' perspective. It utilized the ISM and IRP methods that are extensively used in developing mutual influences among different variables and in identifying the dominance relationships respectively. It commenced with the various steps of the ISM method and demonstrated that the team member characteristics are the main driving elements in the successful implementation of the virtual project teams.

The Chapter also applied the IRP method to rank the various factors of trust building with reference to key benefit areas. The IRP model revealed the degree of the communication is the most important barrier for the virtual project teams when

evaluated against benefit areas for trust building in construction businesses. This study showed that the IRP is a more powerful method compared to the ISM because it goes one step further and considers the relationship of factors of trust building with reference to various benefit areas.

The next chapter deals with the conclusions and recommendation of the study.

Chapter 9

Conclusion and Recommendations

9.1 Introduction

This study has demonstrated the lack of models for trust for virtual project teams within the construction sector in the context of the Middle East which was presented in Chapters 1 and 3. Hence the study started by defining virtual project teams and identifying their challenges in the development of trust in virtual project teams. This led to the construction of hypotheses for the research. This proposed model of trust was tested after collecting data from the professionals working in virtual project teams for the Middle East Construction Industry. The data collected was further analysed by using various statistical software. This model of trust was validated through semi-structured interviews of team members and project managers of virtual project teams of construction sector. The ISM and IRP techniques provided the relationships between the various factors of trust and also ranked them according to their importance with respect to the Middle East construction projects. This model of trust provided guidelines for the project managers and senior management for building trust in virtual project teams. To achieve this aim, seven research objectives have been developed in chapter 1 with relevant research questions to be answered in the research.

This chapter reviews the achievement of the research questions through its aim and objectives in section 9.2. Section 9.3 reviews the original contribution of this study while section 9.4 deals with the implication of the study. Section 9.5 presents the limitations of the study. Based on the findings, a list of recommendations for senior management and project managers for developing trust within virtual project teams is suggested in section 9.6. Section 9.7 suggests future research before the conclusion of the research.

9.2 Attainment of Research Questions through research objectives

In this study, the importance of trust building within the virtual project teams for the construction sector in context of the Middle East is being focussed upon. It was seen from comprehensive study of literature that trust plays a great role in the performance of virtual project teams. The lack of trust results in lack of information sharing and results in conflict in the virtual project teams. Therefore, the aim of this study was achieved through several research questions by accomplishing specific research

objectives. The key findings are synthesised below with respect to the original research objectives and their related questions as stated in chapter 1.

RQ 1: What are the challenges faced by Virtual project team members for providing better performance in a team?

This research question was achieved by objective 1 and objective 2 which are discussed as follows:

Objective 1: Understanding the need and concept of virtual project teams in construction sector.

Objective 2: Identify the factors affecting the performance of virtual project teams and to examine the concept of trust in virtual project teams.

In order to understand the concept of virtual project teams in construction sector, it becomes vital to review and document previous studies. Consequently, the researcher has conducted literature review on a wide range spectrum of topics under the umbrella of virtual project teams. This is being documented in chapter 2 that aimed to review the virtual project teams. This chapter initially focussed on the processes followed in construction industry in UAE and later highlighted the need of virtual project teams in construction sector of the Middle East, due to globalization. It also provided the various definitions of virtual project teams and adopted the common definition that relates itself to construction industry. In order to understand the virtual project teams, it was very important to first realize the different kinds of virtual project teams. The comparison of traditional teams and virtual project teams helped to know the importance and advantages of virtual project teams. To understand the implementation details of virtual project teams, it's very important to critically review the challenges of virtual project teams. As not enough research has been done in construction industry of Middle East in this respect, the researcher found from other countries' literature that the teams often face issues like trust building, communication related issue, bonding among the teams, leadership issues as the managers are at different location and diversity of the team that brings in lot of conflicts in the team. This chapter also demonstrated the layer and types of trust available in the literature of virtual project teams. It has also been documented in this chapter that only 37.60% of construction companies in the Middle East use virtual project teams. Due to this, large engineering effort is required to perform the activities of construction

companies. Also, because of globalization, the construction companies have realized the importance of virtual project teams and started implementing them. But many of them have also realised the challenges associated with the development of trust in virtual project teams and hence wanted to address this issue. Therefore, this chapter helped the researcher to understand the concept and challenges of the virtual project teams in construction sector and became a foundation for analysing the various factors involved in the development of trust within the teams.

RQ 2: What role does Trust play in the performance of Virtual Team?

This research question was achieved by objective 3 which is discussed as follows:

Objective 3: Analyse the various existing models showing effect of trust on performance.

Objective 1 and 2 has demonstrated that due to globalisation, it is becoming necessary for construction organizations to adopt virtual project teams in order to deal with the challenges of the contemporary business environment. This also resulted in knowing the various challenges involved for the performance of virtual project teams. Chapter 3 has discussed in detail the various kinds of models in different industrial sectors. It was needed to understand the role of trust in performance of virtual project teams. This helped the researcher to understand the different models available in literature which have been tested statistically and validated by using different research methodologies. The models of performance dealt with the issues of trust, leadership, conflict, diversity, knowledge sharing and cultural differences. These models provided the issues pertaining to inputs, socio-emotional processes and task processes and outputs for the performance of the teams.

Therefore, this chapter has helped the researcher to find important parameters for trust development. The existence of various models of performance provided the researcher an insight into the relationship between various factors and challenges responsible for performance of the virtual project teams. It has also shown that trust in the virtual project teams plays a significant role in the performance of teams. This has also resulted in providing the researcher the information pertaining to the various research methodologies to be used in the research. This information was very much

necessary as it has become the starting point to analyse the existing models to enable it to move ahead to be tested in the environment of the Middle East.

RQ 3: What are the factors affecting Trust in Virtual team members?

This research question was achieved by objective 4 and 5 that are discussed as follows:

Objective 4: Critically examine the existing models showing the effect of various factors on trust in virtual project team members.

Objective 5: To identify the factors (drivers and barriers) of trust development among virtual project team members

Chapter 3 has discussed in detail the various kinds of models in different industrial sectors and was helpful in achieving the objective 4. It was needed to gain knowledge on various factors affecting trust in virtual project teams. This helped the researcher to understand the different models available in literature which have been tested statistically and validated by using different research methodologies. The models depicting the factors affecting trust in teams, highlighted the issues of interpersonal trust, effect of gender and diversity, satisfaction of employees, effect of team evaluation, team member characteristics dealing with ability, benevolence and integrity and effect of conflict on trust building.

Therefore, this chapter has helped the researcher to find important parameters for trust development. The existence of various models of trust provided the researcher an insight into the relationship between various factors and challenges of trust building. It has also shown that trust in the virtual project teams plays a significant role in the performance of teams.

Chapter 4 attempts to shed light on the achievement of objective 5. This chapter was based on the review of comprehensive literature on construction industry to identify the various drivers and barriers of trust development in virtual project teams. A total of 149 research articles were reviewed and methodologically analysed to identify 40 indicators for trust development. The identified indicators are - *Team Size, Respect, Recruitment Strategy, Reward plan, Communication, Employee satisfaction, Network Security, Training, Clear Objectives, Task Complexity, Task- Technology fit,*

Diversity, Cultural Barriers, Language Barriers, Ability, Integrity, Benevolence, Propensity to trust, Risk, Knowledge sharing, Cognitive elements, Affective elements, Group Cohesiveness, Perceptions of the process, Decision Quality, Decision Quantity, Conflict, Group Heterogeneity, Leadership, Organizational resources, Team reflexivity, Team Effort, Team monitoring, Time difference and holidays, Team Evaluation, Organizational Culture, Motivation, Task Interdependence, Satisfaction of outcomes and control variables such as project length, age, gender, work experience, comfort with computers. Each of the 40 indicators has been cited in various research articles and many researchers have commented on the importance of such indicators with respect to the building trust in a virtual project team. After understanding the definition of these indicators and finding the communalities among them, these indicators were grouped into 12 factors. The findings of literature and these factors assisted the researcher to build research hypothesis that indicated the positive or negative effects of these factors on trust building in virtual project teams. This information resulted in the formation of theoretical model of trust. The fulfillment of this objective led to the formation of Objective 6.

RQ 4: How to assess the impact of those factors on the trust among virtual team members?

This research question was achieved by objective 6 that are discussed as follows:

Objective 6: Propose and validate the model for assessment of trust within virtual project teams of construction sector in the Middle East.

This objective was fulfilled by the discussions that happened in chapters 5, 6, 7 and 8. The research methodology used for this research is finalised in chapter 5. It stated the use of mixed method of quantitative and qualitative analysis for this research. During quantitative analysis, questionnaire for the required participants were framed. The semi-structured interviews assisted in validating of the proposed model of trust.

The chapter 6 showed the empirical results of quantitative analysis. The pilot study with professionals from construction sector was completed in research development phase and its analysis suggested improvements in the design of questionnaire. The final online questionnaire was distributed online across the professionals of construction sector in the Middle East. Then the factor analysis with the help of IBM

SPSS tool was conducted to identify latent constructs. This analysis in this research brought seven factors in limelight namely Organizational Culture, Conflict within the team, Characteristics of team members, Trust within the team , Diversity of the team, Communication of the team and Cohesion in the team. These factors were consistent with the factors which the researcher got after combining the 40 variables from comprehensive Literature review. These factors were considered as main latent constructs for the construction of model of trust for virtual project teams in construction sector of Middle East. The next step was to test the hypothesised theoretical model proposed in chapter 4. This was done by using Structural Equation Modelling using IBM AMOSv22. It was used to model and analyse the inter-relationships among latent constructs effectively, accurately and efficiently. The theoretical model of trust is directly converted into AMOS graphic for analysis. This graphic helped the researcher to validate the measurement model of a latent construct using Confirmatory Factor Analysis (CFA). Once CFA is completed, the researcher moved into modeling the Structural Equation Modeling (SEM). This procedure permitted an assessment of the integrity of the measures, as well as an evaluation of the degree to which the observed relations among variables fitted the hypothesized network of causal relationships. The different factors which affect the trust within virtual project teams came out to be

a) Organizational culture of the company affects positively in the building of trust.
b) Diversity of the team members came out to be positively affecting the trust building which was against the literature findings.
c) Degree of communication within the team affects positively the trust building in virtual project teams.
d) Team Members' characteristics affects positively in trust building.
e) Conflict within the team behaves in two different ways. The task conflict brings in more discussions and different perspectives to the same problem. It helped in building the trust in each other's capabilities towards achieving company's goal. If the conflicts results in relationship conflict, it greatly effects the bonding of the team members as it leads to ego and hence effects the trust building.

f) Cohesion of the team helps in building the trust among team members. The more bonding of team members, it results into less conflicts and further enhances the performance of the entire team.

It has been found that the following two factors do not affect the virtual teams in Middle East:

a) Leadership skills of the Superior
b) Task- Technology fit

Also it has been found that cohesion and conflict plays a role of mediator in the various relationships. The experience of professionals in virtual project teams led to the understanding that there needs to be proper mix of experienced people and fresher recruited for the virtual project teams. This not only will increase the performance of the virtual project teams but enhances the trust building in the teams.

The model of trust which was developed after empirical findings of quantitative analysis came out to be different of what the researcher proposed in chapter 4. Hence the validation of the model was required. It was done in chapter 7 qualitatively by conducting semi-structured interviews of 10 professionals from construction sector of the Middle East. Out of these 10 professionals, 4 were project managers and 6 were team members of various virtual project teams in the construction sector of the Middle East. The findings which emerged from the interviews were organized into nine major themes: Trust and Organizational Culture, Trust and Communication, Trust and Diversity, Trust and leadership, Trust and Task- technology fit, Trust and Team member Characteristics, Role of Conflict on trust, Role of Cohesion on trust and effect of experience in building the trust in virtual project teams. The results of these interviews supported the model of trust which was a result of quantitative analysis. The professionals from the industry were also asked the benefits of trust for the virtual project teams. They identified four benefits of trust namely Improved performance of the team, Better collaboration within team, Sharing of knowledge and faster execution of projects with minimized delay. These benefits became foundation for Interpretive Ranking Process- a technique to rank the various factors with respect of their importance in the context of the Middle East Construction projects.

Chapter 8 dealt with discussions of Interpretive Structural Modeling (ISM) and Interpretive Ranking Process (IRP). These techniques were used to further stress on the relationships between various factors of trust. The ISM analysis revealed that all the above factors are interlinked. The ISM model shows that characteristics of team members such as ability, integrity , benevolence, competence, reliability and professionalism are the most significant factors for building trust in virtual team members. The team members' characteristics effects the communication within the team, conflict in the team, cohesion of the team and also effects the diversity of the team. But, it does not play any role in the organizational culture of the companies. The organizational culture of the the company consists of many elements such as clear objectives and goals, recruitment strategy, rewards of the team members, fair policy of team evaluation, mentoring of the team members and degree of task interdependence. It stands at the second level of ISM hierarchy. It effects the communication within the team by acting as the motivational factor for the team members . The fair policy of team evaluation reduces the friction among the members of the team thus building strong bonding within the team members. Whereas the relationship conflict within the team spoils the organizational culture of the company,and the task based conflict increases the creativity and productivity of the team. The diversity of the team members, communication among the team members, conflict within the team and cohesion of the team form the top level of the hierarchy. The factors at this level are dependent on other issues for their existence. Thus the ISM model brings out the relationship among the factors of trust which are needed to be thought by the project managers and top level management to have trust building within the virtual project teams.

To offer more insights on the benefits offered by the trust, chapter 8 utilized IRP to rank the different factors of the trust with respect to the benefits presented in chapter 7. In the IRP results, the communication within the team has proved to be an important factor of trust building that influences the benefit areas of Better collaboration of the team (P2), Sharing of information (P3) and faster execution with minimized delays (P4). The organizational culture of the company was at rank 2 on influencing all benefits of trust within the team. The organizational culture includes norms regarding the flow of information and cross boundary collaborations. The organizations must provide appropriate physical, financial and social support. The

organizational culture influences improved performance of the team by providing clearer roles and goal setting to the team members. The rank 3 deserves to have factor as cohesion of team which influences Better collaboration of the team (P2), Sharing of knowledge (P3) and faster execution of the projects (P4). The collaboration within the team can be achieved when there is a positive attitude towards each other in a virtual project team. This positive attitude comes with feeling of respect towards other team members. The characteristics of the team members happened to come at rank 4 in the IRP model. It influences improved performance of the team (P1), Better collaboration within the team (P2) and faster execution of the projects (P4). The performance of team gets heightened when the team members possess necessary skills and competencies required for the particular project. The rank 5 of the IRP model boosts the diversity of the team as a challenge to trust building. It influences improved performance of the team (P1) and sharing of information (P3). The diversity of the teams may bring in the situations where the parties of interest are dissimilar with respect to some attributes. The conflict within the team is at rank 6 and does not contribute to any performance areas of trust.

In summary, the relation which developed between the factors of trust building in virtual project teams and various benefit areas using the IRP technique can be considered as a novel approach, contributing towards the development of virtual project teams in construction sector of the Middle East.

9.3 Original Contributions of the study

The study has contributed to the body of knowledge in several ways (stated in chapter 1) that are broadly divided into three major areas, as outlined in this section.

Theoretical Contributions

The prior studies showed an absence of literature on trust building in virtual project teams of construction sector of the Middle East (Chinowsky & Rojas, 2003; Hosseini & Chileshe, 2013). Moreover, the results of the studies from other sectors of the industry cannot be relied upon for construction sector due to the obvious specific approach of this industry (Love et al., 2001). This implies that knowledge on virtual project teams should be created within the natural context of the construction industry. As a result, the construction industry has remained in need of creating

knowledge to supply the industry with essential information of the challenges faced in deploying virtual project teams on construction projects (Hosseini & Chileshe, 2013).

To fill this gap, the current study has examined the existing literature thoroughly in chapter 2 to identify the challenges of the virtual teams and to stress the importance of trust in virtual project teams of construction sector. In this chapter, through various tables showing the number of studies by year, type of study and team size, it was shown that out of 59 organizational studies, only 8 studies have been done so far which involving trust among suppliers, owners and contractors of construction sector. This was a great indicator as whatever studies involving trust among virtual project teams members have happened, they are from high tech IT companies, Online Communities, Telecommunication Company, Health care Industry from various parts of world such as South Africa, Australia, UK, USA, Germany, Egypt, Malaysia, Korea, Brazil, Taiwan and Turkey. This is the first theoretical contribution to the existing knowledge which shows that there is a gap of studies for the models of trust involving virtual project teams of construction sector of the Middle East.

The chapter 3 documented the findings from various existing models of trust and performance from various industries. It provided an exhaustive list of relevant models and developed a table which depicted the methodology used, team sizes of virtual project teams and whether the studies were conducted on students or professionals. This was the second theoretical contribution of the study as such an exhaustive table of models involving trust and performance was never constructed. And they are very useful for future practitioners for the further research.

In addition, it provided a comprehensive list of 40 indicators responsible for trust building in virtual project teams. The construction of extensive indicator table with entire list of citations provides additional information on their importance in construction literature. These 40 indicators were reduced to 12 categories and then to 8 classification names. Based on the literature review on these indicators, various hypotheses were constructed. Broadly in these hypotheses, the role of organizational culture, degree of communication, cohesion of the team, conflict in the team, leadership skills of the superior, diversity of the team, characteristics of the team members and task-technology fit is being tested in the development of trust in virtual

project teams of construction sector of the Middle East. This is the third contribution to the existing knowledge on the virtual project teams as the earlier studies have not taken account of such exhaustive factors of trust building in virtual project teams in construction sector.

This entire discussion has definitely added a value to the body of literature for virtual project teams in the context of the Middle East construction projects. It has become more important as this kind of research was not done anytime with respect to the virtual project teams for construction sector in the Middle East.

Methodological Contributions

The study has contributed to the methodology by developing some of the reliable and valid constructs in this social science research. The research onion developed by Saunders et al (2009) was used to understand the entire research methodology of this research. In fact, each of the layer of the research onion was thoroughly investigated with this research. Such a detailed discussion on research onion was not done earlier with trust building research topic for construction sector. It was the first methodological contribution of the study as each layer is elaborated in detail in chapter 5.

The second contribution of the methodological is that this research has employed Abductive research approach which is not seen in any of the literature research paper regarding trust building in virtual project teams. Abductive approach is a combination of *Deductive* as well as In*ductive* processes. The initial part of the research followed a deductive pattern – factors were identified after Literature Review, Conceptual model was created using Literature review, the survey instrument was tested by Pilot Study theoretical model of trust was refined by analysing data collected from questionnaire. The remaining part of the research was Inductive – the refined model was applied to existing virtual project teams and analysis was done to validate the model.

The third contribution to the methodology is that this study introduced Structural Equation Modelling using AMOS software to the research of virtual project teams in construction sector of the Middle East as a relevant quantitative technique for testing of hypothesis of proposed model of trust. Structured Equation Modelling (SEM) is a

multivariate technique and was used to analyse the structural relationship between measured factors and the latent constructs. The best part of SEM was that it explicitly species error in measurement. The goal of SEM is to determine whether a hypothesized theoretical model is consistent with the data collected to reflect this theory. The consistency is evaluated through *model-data fit*, which indicates the extent to which the postulated network of relations among variables is plausible. The model fit of model of trust was done by examining multiple tests such as chi-square, Comparative Fit Index (CFI), Bentler- Bonett Non-normed Fit Index (NNFI), Root Mean Squared Error of Approximation (RMSEA) etc. SEM requires large sample size (usually $N > 200$; e.g., Kline, 2005, pp. 111, 178). And for this research, the data from 403 professionals of construction industry was collected. This SEM methodology evaluated the model of trust in two ways which was not used earlier in the construction sector for model of trust for virtual project teams. One is the evaluation of measurement model and the second was evaluation of structural model. The convergent validity of the model of trust was tested by the condition that the average variance extracted (AVE) by each construct should exceed the variance due to measurement error for that construct (i.e., AVE should exceed 0.50) (Fornell & Larcker, 1981). Discriminant validity was verified by examining that the square-root of the AVE from the construct. It should be greater than the correlations shared between the construct and other constructs in the model (Fornell & Larcker, 1981).

The entire data for the research was collected through online questionnaire developed by using survey monkey. Therefore it was very much needed to know whether the collection instrument has introduced any bias in responses and has caused variances in the responses. For this common method bias was used to find out whether single method of data collection has introduced any noise in the data. There was no issue of common method bias found in the study. This indeed was fourth methodological contribution as many researchers even do not even bother to check this condition.

The fourth contribution to the methodology was that sobel tests were used in the hypotheses testing for mediation as baron and Karon approach is dead. It involved certain set of operations to find whether the mediation was partial and full. This is entirely a new approach towards mediation tests.

The fifth methodological contribution was that this research employed Interpretive Structural Modelling(ISM) to examine the relationships between factors of trust building. This technique was used to develop a hierarchical structure for analysing the interactions among factors of trust. ISM was used to complement the quantitative and qualitative methods to facilitate a better understanding of the different trust building factors of virtual project teams in construction sector. ISM methodology proposes the use of the expert opinions based on various management techniques such as brainstorming and nominal group discussion technique in developing the contextual relationship between the various factors of trust. Initially, a group of expert people with required knowledge, skills, and backgrounds is selected. This group should consist of experts from different areas with a wide-ranging skill-set. It further assists in classification of these factors depending upon their driving and dependence power using indirect relationship MICMAC analysis. The proposed model provides a useful tool for project managers of virtual project teams of Construction sector to focus on those factors that are most important for building trust among teams, thereby enhancing the productivity of the team. Understanding the factors and their relationships will help construction companies of Middle East to address the major issues of trust building or at least understand them so that they can plan for them if they see distrust among the team members affecting the performance of the team. The findings revealed that these elements are highly interlinked therefore it was essential to structure these relationships.

The sixth methodological contribution was that this research employed Interpretive Ranking Process (IRP) which is a novel ranking method that combines and uses the strength of both the logic choice process with the intuitive process of decision-making. It builds on the strength of a pair-wise comparison approach which minimizes the reasoning overload. IRP used two set of variables. One set of variables that are to be ranked, in this case the factors that affect the trust within the team and the other set of reference variables that provide the basis for ranking, in this case the benefit of trust building (Haleem et al., 2012). Based on inputs from industry experts, four key benefits of trust have been used in this study that include Improved performance of the team (P1), Better Collaboration within team (P2), Sharing of knowledge (P3) and Faster Execution with minimized delays(P4). This study contributed to the virtual project teams' literature of construction sector of the Middle

East by ranking the different factors of trust building needed for the virtual project teams with reference to the key benefits areas to indicate which factors have the leading role in delivering the various benefits to the companies.

Practical Contributions

In recent years, virtual project teams have been gaining momentum and have been adopted by construction sector of the Middle East due to globalization. This study was based on the empirical data from the Middle East construction Industry, thus reflecting a new practical application and dimension of virtual project teams. Furthermore, the study has proposed a model of trust for virtual project teams which will be beneficial to construction companies and their project managers. The model of trust was validated through experts' interviews and was well received by them. The findings were helpful for the senior management and project managers of construction industry to concentrate on the issues which results in the development of trust within virtual project teams. In fact the study proposed three models of trust.

The first practical implication emerged from the first model of trust which got evolved through data collected from the professionals of the Middle East. The theoretical model of trust was proposed based on the literature review. This literature on various indicators of trust helped the researcher to create hypotheses for the model of trust. And finally the hypotheses were tested using SEM using AMOS. This model was validated by the semi-structured interviews of 10 professionals of the construction sector of the Middle East. And it was found that organizational culture of the company, diversity of the team members, degree of communication within the team, team members' characteristics, conflict within the team and cohesion of the team effect positively in the building of trust in virtual project teams of construction sector. Whereas the leadership skills of the superior and task- technology fit does not affect the building of trust in virtual project teams.

The second practical implication emerged from the ISM model of trust. The ISM model shows that characteristics of team members such as ability, integrity , benevolence, competence, reliability and professionalism are the most significant factors for building trust in virtual team members. The organizational culture of the

company consists of many elements such as clear objectives and goals, recruitment strategy, rewards of the team members, fair policy of team evaluation, mentoring of the team members and degree of task interdependence. It stands at the second level of ISM hierarchy. The diversity of the team members, communication among the team members, conflict with in the team and cohesion of the team form the top level of the hierarchy. The factors at this level are dependent on other issues for their existence.

The third practical implication stemmed from the IRP model of trust. The communication within the team (F3) has proved to be an important factor of trust building that influences the benefit areas of Better collaboration of the team (P2), Sharing of information (P3) and faster execution with minimized delays (P4). The organizational culture of the company (F1) is at rank 2 and influences improved performance of the team (P1), Better collaboration within the team (P2), Sharing of Knowledge (P3) and faster execution with minimized delays (P4). The rank 3 deserves to have factor as cohesion of team (F6) which influences Better collaboration of the team (P2), Sharing of knowledge (P3) and faster execution of the projects (P4). The characteristics of the team members (F4) happened to come at rank 4 in the IRP model. It influences improved performance of the team (P1), Better collaboration within the team (P2) and faster execution of the projects (P4). The rank 5 of the IRP model boosts the diversity of the team (F2) as a challenge to trust building. It influences improved performance of the team (P1) and sharing of information (P3). And finally, the conflict within the team (F5) is at rank 6 and does not contribute to any benefit areas of trust.

9.4 Recommendations for the implementation of trust in virtual project teams in construction sector of the Middle East

Based on the empirical findings and after validation of these findings, the following recommendations for senior management and project managers, are aimed at increasing the use of virtual project teams and building trust among team members for increase in their performance:

- The project managers are required to provide clearer goals and deadlines to the virtual project team members as it gives them a sense of belonging to accomplish organizational goals. It helps them to focus on their capabilities and to deliver their

best and results in great motivation which indirectly assist them in developing trust with the organization.

- The senior management needs to have their recruitment policy in place along with transparent nature of its working. The recruitment strategy of the organization would help the team members to have right kind of people in the team. This not only builds the trust in each other's capabilities but also results in reputation benefits for the companies.
- The senior management and project managers should make sure that the conflicts in the teams should not results in ego and relationship conflicts. They should see that the frequency of these conflicts should be minimal as it leads to diminish creativity and quality, erodes team unity and commitment.
- The project managers need to see that there is a proper mix of experienced and fresh graduates for the projects. The experience people are good at handling the tough situations easily, can convince the clients and contractors better and are very good in analysing the results from the data. Whereas the fresh graduates accelerate the projects by learning new technologies quick and can work faster.
- The project managers should also see that the communication tools and technology needs to be updated as per the requirements of the virtual project teams. This is highly recommended as the teams are globally dispersed and needs to have well defined communication structure to build trust among teams.
- The construction companies need to have transparent rewarding policies that should benefit the teams. These rewarding structure encourages cooperative efforts of the team rather than the competitive feelings of the team. The team members will have trust in their team mates and in organizations as they understand that there is no biasing involved in the evaluation of the individuals.
- The senior management is required to see that proper trainings on team building, conflict management, interpersonal and management skills and enhancement in problem solving should be given to team members. It helps them initially to break ice with the new members of the project teams and later equip them with the necessary skills to build trust within the teams.
- The organization should develop fair policies of team evaluation so that the team members become confident that there are no biasing happening in the company.

This helps them get motivated and satisfied assisting them to develop confidence and trust within the team.

9.5 Limitations

Although the main aim and objectives of this research were met, this section highlights the limitations of this study as summarise below:

- There is lack of generalizability of results of the research. Not all the countries of the Middle East could participate in the research. Even though the literature review was conducted covering most of the countries of the Middle East, but this research covered Oman, Qatar, Kuwait and the United Arab Emirates for the analysis. The results could have been more generalized if other countries could have also been included. It was primarily because of limitation of time and resources.
- The research used only non-probability judgemental technique for data collection from respondents. Even though the thesis did reach the sample size and the response rate is accepted and trustworthy, another sampling frame might have contributed to a different result since it may have reached a broader part of the population.
- The results of SEM analysis i.e. Model of trust was validated through semi structured interviews of 10 professionals of construction sector. The results could have been more generalized if case study approach would have used for validation by taking interviews of team members and team leaders of three different sized (small, medium, large) virtual project teams of construction sector .
- In spite of virtual project teams approach achieving greater heights in other industries, the topic of trust in the construction sector of the Middle East remains fundamentally under-researched topic. This has implication on finding comparable construction studies that would have influenced the results of the current research.
- The scope of the study deals with the professionals from Middle East construction Industry. Although the study has covered professionals including architects, consultants, contractors, clients and interior designers but it proved difficult to include professionals like material suppliers and manufacturers.
- From the data collected, it was seen that only 85 team leaders responded to the online questionnaire as against 238 team members of virtual project team members.

The findings of the research could have been affected if more team leaders might have responded.

- The ISM model of trust and IRP findings were not validated with professionals of the virtual project teams due to limitation of time.

9.6 Future Direction

During the process of the thesis different aspects that aroused can be developed and further implicated in a later research. One aspect to take in consideration in future research is the sampling frame. Since the population of the thesis was non-probabilistic in nature and confined to graduates in the virtual project teams and the limitation of time and economical resources, the result might have been affected. In future research the implications for sampling frame is to have a broader sampling who represents a larger sample from the population. If the research will be considered in a later point in time, the sampling frame need to be taken in mind if the aim with the research is to make a general conclusion for the entire population involving virtual team members.

Another aspect is that the research provided a definition and explanation of six components that affect the trust building in virtual project teams of construction sector in the Middle East. The study got the theoretical and empirical perspective of private sector construction companies. The study can be extended for the projects dealing with government sector. A future research can be carried out to investigate the role of government in recruiting and maintaining the virtual project teams.

A further consideration could be difference between the behaviours of female and male in virtual Project teams. In this research, it has been found that 107 females as against 216 males have responded to the questionnaire. This indicates that the females have been quite active in virtual community and this comparison of genders to trust development can be considered for the future research.

The research can also be interesting in a perspective of young versus older generations and their perceptions regarding the contributing factors when developing trust in virtual project teams. In this research, it has been shown that experience in virtual projects of virtual project team members plays a great role in developing trust

in these teams. Further to this, it has been concluded in the research that young people in teams are very energetic and are capable of learning new technologies whereas the older people are very useful for analysis the business rules and convincing the different clients in the construction industry.

The case study approach can be used for the validation of results as future scope as in this research, the qualitative analysis was used. Last but not the least, the validations of ISM and IRP results can be taken as future research. It was not done in this research due to lack of time and resources.

9.7 Concluding Remarks

Since the beginning of this research, it has been an interesting and challenging learning experience for the researcher. The rigour since the beginning of the research from the changes in proposed topic, to refinement in aim and objectives following extensive review of literature clearly helped to identify the gap. An initial critical review of available and related literature also provided a platform to redirect the aim and objectives. In addition, it facilitated a deeper understanding in the research area comprising Virtual project teams, different types of virtual project teams, challenges of virtual teams, drivers and barriers of trust, understanding of existing models of trust and performance, generating research hypothesis and theoretical model of trust.

The review of literature was the outcome of chapter two of the research exploring the concepts of Virtual project teams and their challenges with respect to construction sector in Middle East. The existing models of trust and performance was studied, though they were not in the context of Middle East, but yet they gave the researcher the required understanding of the challenges faced by the virtual project teams in construction sector in chapter 3. The 40 indicators affecting trust building in virtual project teams was researched through the comprehensive literature review in chapter 4. This also led to the development of research hypothesis and construction of theoretical model of trust. The research methodology adopted in the research was discussed in detail in chapter 5. The analysis of pilot study and refinement of questionnaire became the starting point of chapter 6. This chapter dealt with data collection and analysis of data using factor analysis through IBM SPSS software and Structure Equation Modelling using IBM AMOS software. This resulted in the testing

of hypothesis of theoretical model of trust developed in chapter 4 and led to the development of model of trust building for virtual project teams of construction sector in the Middle East.

The model of trust provides construction management with the relevant factors affecting the trust building for virtual project teams. This model of trust was validated through semi-structured interviews of experts from the construction industry in chapter 7. It also generated themes of trust which needs to be taken care by the senior management and project managers while designing and maintaining virtual project teams for the projects. The interviews with the experts also mentioned the benefits of trust for the virtual project teams. This also acted as a motivation for the construction industry to adopt virtual project teams. To offer more insights to the development of trust in virtual project teams, ISM and IRP techniques are used. The ISM provided the relationships between the challenges and to develop insights into a collective understanding of these relationships. IRP technique helped the management and project managers to find the ranking of various factors of trust with respect to the benefits of the trust. This helped them in decision making and understanding of each factor of trust building.

This research made contribution to the existing knowledge on virtual project teams in construction sector. This research contributed to further understanding of the factors that are extremely critical for the success and failure of virtual project teams and which are not presented before with respect to the construction sector of the Middle East. The research also highlighted the emotional as well as technological parameters that play a crucial role in virtual project management. It is expected that the outcome of this research will be of interest to construction industry professionals and policy makers.

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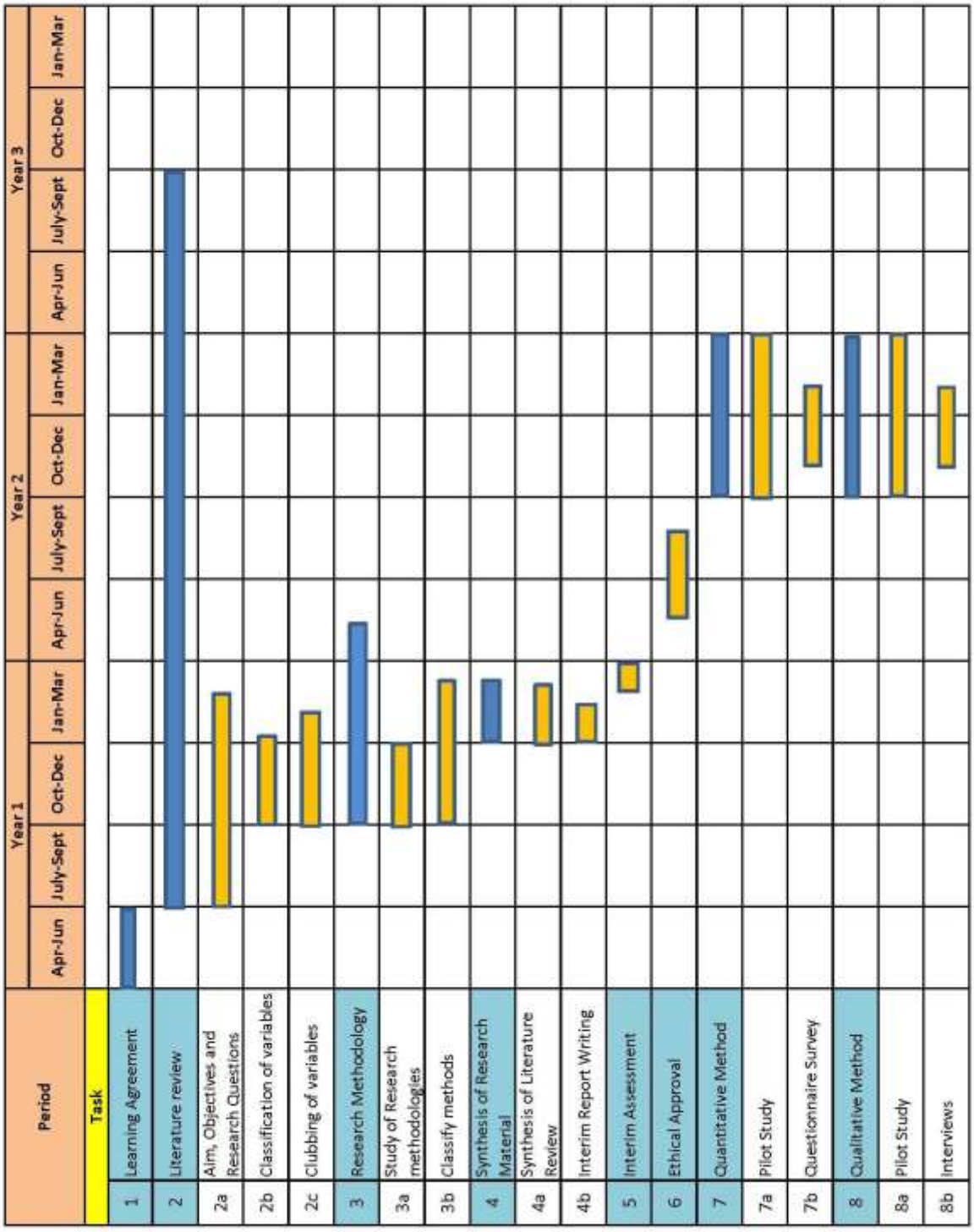
APPENDIX I – TRAININGS ATTENDED BY THE RESEARCHER

S. No.	Organiser	Date	Place	Title of the Training
1.	Endnote.com	2nd July 2014	United Arab Emirates	"Session on Endnote Desktop" by Donna Kirking, Senior Product Trainer, Researcher Solutions. Thompson Reuters
2.	SOBE, University of Salford	8th July 2014	United Arab Emirates	"The Seven Secrets of Successful Research Students" by Hugh Kearns and Maria Gardiner (Flinders University, Adelaide)
3.	SOBE, University of Salford	30th October 2014	United Arab Emirates	"Research Methodology – Just a load of Vegetables" by Prof. Marcus Ormerod
4.	SOBE, University of Salford	12th November 2014	United Arab Emirates	"Research and its Relationship with Practice" by Dr. Paul Chynoweth
5.	Manipal University, Dubai	9th November to 14th December 2014	United Arab Emirates	" Research Methodology" by Dr. Masroor Alam
6.	SOBE, University of Salford	7th January 2015	United Arab Emirates	" Critical Thinking in Research: Perspectives from both Theory and Practice" by Dr. Bingunath Ingirige
7.	SOBE, University of Salford	14th January 2015	United Arab Emirates	"The Collection, Analysis , Interpretation and Presentation of Data" by Prof. Les Ruddock
8.	SOBE, University of Salford	26th January 2015	United Arab Emirates	" Conference Publishing" by Prof. Vian Ahmed
9.	SOBE, University of	3rd February 2015	United Arab Emirates	"Building Your Research Profile" by Prof. Peter Barrett

	Salford			
10.	SOBE, University of Salford	11th February 2015	United Arab Emirates	" Research Ethics Approval Process" by Dr. Chaminda Pathirage
11.	SOBE, University of Salford	16th February 2015	United Arab Emirates	"The CIB student Chapter- Mock Internal Evaluation" by Prof. Vian Ahmed and Dr. Chaminda Pathirage
12.	SOBE, University of Salford	18th February 2015	United Arab Emirates	"Case Study Research- Personal Reflections on a Long Research Journey" by Dr. Rod Gameson
13.	SOBE, University of Salford	19th February 2015	United Arab Emirates	"Qualitative Research: Content Analysis" by Dr. Udaya Kulatunga
14.	SOBE, University of Salford	26th February 2015	United Arab Emirates	"How to Write a Conference Paper" by Prof. Vian Ahmed
15.	SOBE, University of Salford	15th April 2015	United Arab Emirates	"Preparing for the Interim Assessment and Internal Evaluation" by Prof. Jason Underwood
16.	SOBE, University of Salford	17th June 2015	United Arab Emirates	"Preparing for Viva" by Prof. Vian Ahmed
17.	SOBE, University of Salford	18th Nov. 2015	United Arab Emirates	"Research and its Relationship with Practice" by Dr. Paul Chynoweth
18.	SOBE, University of Salford	13th January 2016	United Arab Emirates	"Preparing for the Interim Assessment and Internal Evaluation" by Prof. Jason Underwood
19.	SOBE, University of Salford	20th January 2016	United Arab Emirates	"The Collection, Analysis , Interpretation and Presentation of Data" by Prof. Les Ruddock

20.	SOBE, University of Salford	17th February 2016	United Arab Emirates	"Case Study Research – Personal Reflections on a Long Research Journey *" by Dr Rod Gameson*
21.	SOBE, University of Salford	13th April 2016	United Arab Emirates	"Writing a Critical Analysis of the Literature*" by Dr Sara Biscaya*
22.	SOBE, University of Salford	29th May 2016	United Arab Emirates	"Validity and Reliability in Quantitative Research" *by Prof. Mohammed Arif*

APPENDIX II – THE SCHEDULE OF THE RESEARCH



LEGEND:

Total period of task completion

Sub-task period - Completed

Sub-task period - Pending

APPENDIX III – MEETINGS WITH SUPERVISOR

Appendix III contains the details of the meetings of the researcher with the PhD supervisor Dr. M. Arif. The following table contains details of the in-person meetings as well as online meetings/discussions through Blackboard Collaborate sessions and Skype.

Meetings with PhD Supervisor – Dr. M. Arif

S. No	**Date**	**Place**
1.	15th April 2014	United Arab Emirates(Personal Meeting at Local Advisor home)
2.	29th April 2014	Blackboard Collaborate Session
3.	27th May 2014	Blackboard Collaborate Session
4.	24th June 2014	Blackboard Collaborate Session
5.	1st August 2014	Blackboard Collaborate Session
6.	8th September 2014	Blackboard Collaborate Session
7.	14th October 2014	Blackboard Collaborate Session
8.	25th November 2014	Skype Call
9.	8th January, 2015	Skype Call
10.	25th February, 2015	Skype Call
11.	11th May 2015	Skype Call
12.	5th July 2015	Skype Call
13.	17th August 2015	Skype Call
14.	18th August 2015	Skype Call
15.	4th September 2015	Skype Call
16.	6th October 2015	Skype Call
17.	11th November 2015	Skype Call
18.	19th December 2015	Skype Call
19.	24th January 2016	Skype Call
20.	17th February 2016	Skype Call
21.	8th March 2016	Skype Call
22	11th March 2016	In Person- University of Salford
23.	13th March 2016	In person

24.	27th April 2016	Manipal University, Dubai
25.	21st June 2016	Skype Call
26.	24th June 2016	Skype Call
27.	1st July 2016	Skype Call
28.	18th August 2016	Skype Call
29.	16th November 2016	Skype Call
30.	2nd December 2016	Skype Call
31.	13th December 2016	Telephonic Call
32.	17th December 2016	Skype Call
33.	29th December 2016	Telephonic Call

APPENDIX IV – DETAILS OF REPORTS SUBMITTED

Appendix IV contains the details of the reports submitted by the researcher to the Ph.D supervisor Dr. M. Arif. The following table contains details of the important reports submitted via email till date:-

Details of Reports submitted

S. No	***Date***	***Name of Report***
1.	30th April 2014	Minutes of Meeting No. 1 (29th April 2014)
2.	11th May 2014	Summary of Initial Work Done
3.	31st May 2014	Minutes of Meeting No. 2 (27th May 2014)
4.	16th June 2014	Learning Agreement; Aim and Objectives of Research
5.	29th June 2014	Minutes of Meeting No. 3(24th June 2014)
6.	6th July 2014	Paper Review Summary No. 1
7.	24th July 2014	Paper Review Summary No. 2
8.	12th August 2014	Minutes of Meeting No. 4 (1st August 2014)
9.	2nd September 2014	Paper Review Summary No. 3; Excel sheet containing List of Variables
10.	12th September 2014	Minutes of Meeting No. 5 (8th September 2014)
11.	11th October 2014	Paper Review Summary No. 4; Clubbed variables document; Mind Map; Study of Interpretive Structural Modelling(ISM)
12.	19th October 2014	Minutes of Meeting No. 6 (14th October 2014)
	21st November 2014	Paper Review Summary No. 5; Clubbed variables; Definition of variables document ; Factor Analysis Report
13.	30th November 2014	Minutes of Meeting No. 7 (25th November 2014)
14.	20th December 2014	Research Methodology document; Refined Clubbed variables document; Refined definitions of Variables
15.	13th January 2015	Minutes of Meeting No. 8 (8th January 2015)
16.	17th January 2015	Abstract of Technical Paper for IPGRC 2015
17.	17th January 2015	Research Process Phases document; Gantt Chart

18.	1st February 2015	Draft of Interim Assessment Report
19.	20th February 2015	Corrected Draft of Interim Assessment Report
20.	30th March 2015	Technical Paper for IPGRC 2015
21.	13th May 2015	Minutes of Meeting
22.	15th May 2015	Registration form for the Conference IPGRC 2015
23.	25th June 2015	Work on Structural Equation Modelling
24.	5th July 2015	Draft of Model on Trust
25.	5th July 2015	Minutes of Meeting
26.	12th August 2015	Draft Ethical Form
27.	19th August 2015	Final Ethical Form
28.	25th August 2015	Signed Ethical Form
29.	26th August 2015	Minutes of Meeting
30.	1st September 2015	Questionnaire Draft
31.	12th September 2015	Minutes of Meeting
32.	17th October 2015	Questionnaire Reasoning Table
33.	14th December 2015	Pilot study documents; Initial work on SEM for Trust Model
34.	10th February 2016	First draft of Internal Evaluation Report
35.	25th February 2016	Final draft of Internal Evaluation Report
36.	8th March 2016	First draft of IE presentation
37.	14th March 2016	Final draft of IE presentation
38.	25th March 2016	Self-Evaluation Report
39.	27th April 2016	Minutes of the meeting
40.	24th July 2016	Summary of Interviews
41.	23rd September 2016	Interpretive Ranking Process
42.	21st November 2016	First draft of thesis
43.	13th December 2016	Second draft of thesis
44.	28th December 2016	Fourth Draft of thesis

APPENDIX V- INTERVIEW GUIDE

SEMI-STRUCTURED INTERVIEW

Research Title: Assessment of Trust within virtual project teams of Construction Sector in the Middle East.

This interview survey is based on an ongoing Ph. D research which seeks to understand the phenomenon of project teams with people coming from various cultural backgrounds and different countries to work on various kinds of projects operating in the Middle East. The research will focus on multi-disciplinary virtual project teams, to understand their performance factors and to propose a model to analyse the impact of these factors on trust of virtual project teams in construction sector in the context of Middle East.

The purpose of this survey is to gather information regarding the virtual team of which you are a member. It is important for the researcher to understand how virtual team members think and feel as your company continues to grow and change. Only with this awareness will it be possible to address any areas of concern or those that need improvement.

Benefit to the participant:

The research will contribute to further understanding of the factors that are extremely critical for the success or failure of virtual project teams and which were not presented before with respect to construction sector of Middle East. The research will signify the motivational as well as technological parameters that play a crucial role in virtual project based project management. This research would be beneficial to Project Managers of Architectural / Engineering / Construction Companies by helping them know the actions required for better team collaboration in virtual teams. This will lead to greater team performance and individual learning. The findings from this research will be beneficial for providing better working culture for the virtual project teams of construction sector in the Middle East.

THANK YOU, IN ADVANCE, FOR YOUR HONEST RESPONSES.

SEMI-STRUCTURED INTERVIEW QUESTIONS

Q.1: Give a brief introduction about yourself?

Probes: What is your position in the company? What is the profile of your company (general…it deals into….)? Which country (need different resident interviewees) you belongs to? How long you have been in UAE? What is the nature of your job? What kind of projects you have worked on? What is the size of team you are working in? How long has this team been in existence?

Q1a. So what is the team size on which normally you have been working on??

Q.2: Based on your experience, what are the different challenges for a virtual team?

Q.3: How do you see trust among virtual team members as a challenge to the performance of virtual team?

Q.4a: Based on my findings, I found that there is a positive relationship between organizational culture and Trust. What do you think, there would be reasons for this?

Q.4b: According to my analysis, both cohesion and conflict increases the positive relationship between organizational culture and trust among team members. What do you the think, the possible reasons for this behaviour?

Q.5: It has been found through statistical analysis of data that Leadership skills of project manager do not matter in building of trust among virtual team members. What could be possible reasons for that?

Q.6a: I have established that diversity of team members does not affect negatively on the building of trust. According to you, what could be the possible reasons for this affect?

Q.6b: In addition to this, I have found that Cohesion in the team increases the positive affect of diversity on trust and conflict in the diverse team do not increase any negativity in building the trust among team members. What according to you must be the reasons for this strange behaviour in Middle East?

Q.7a: Based on the research findings, it has been found that presence of Communication among team members greatly helps in building trust among virtual team members. What could be the possible reasons for this effect?

Q.7b: Furthermore, it has been found that cohesion and conflict does not have any role to play in the relationship between communication and trust between the team members. They neither increase nor decrease the positive effect of communication on trust among team members. According to you, what could be the possible reasons for this?

Q.8: It seems from the analysis that task – technology fit does not affect in building the trust among virtual team members. What do you think, the reasons behind this behaviour?

Q.9: The research finding says that the more conflict in the team leads to less cohesion in the team. What are your views on it?

Q.10a: The analysis of data led to a finding which says that the characteristics of team member affect positively on the building of trust with fellow team mates. According to you, what could be the possible reasons for this?

Q.10b: If there is cohesion among team members, the positive effect of team members' characteristics on trust gets increased. What are your views on this effect?

Q.11: How do you think experience (high or low) of team members affects the diversity of the team, communication within the team and cohesiveness and conflicts in a team?

Thank you very much for your time and effort. Highly appreciated. Have an awesome day!

APPENDIX VI – PILOT STUDY INSTRUMENT

Q U E S T I O N N A I R E

The questionnaire consists of the following sections:

Section 1: Demographics

Section 2: Information about the Company Environment

Section 3: Information about the dynamics and communication of Virtual Project Team.

DIRECTIONS

The virtual team survey will take approximately 20- 25 minutes to complete. Please follow the instructions on the survey itself and indicate your responses accordingly.

Section 1: Demographics

This section asks you for general information about you and your team.

1	Age	_____years
2	Gender (Put a tick mark against valid option)	( ) Male ( ) Female
3 4	Education Qualification (Put a tick mark against valid option)	( ) Secondary School ( ) Bachelor's Degree ( ) Master's Degree ( ) PH. D
5	Experience in virtual team	_____years_____months
6	Team Size	_____
7	Team Tenure	_____years_____months
8	Position in team (please tick the correct option)	1. Team Member ____ 2. Team Leader _____ 3. External Team Supporter____
9	Native Country	_____

Section 2: Information about the corporate culture and leadership skills of the project manager

Kindly tick as per the below scale.

		Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Question 1:		**1**	**2**	**3**	**4**	**5**
Corporate Culture: These set of questions ask about the characteristics of your job and organizational environment in which your team operates.						
Clear Objectives and Goals	CC1: My role in the team was clearly explained to me during formation of team.					
Recruitment Strategy	CC2: Team members are selected based on their individual talents and abilities to contribute to the team.					
3.Rewards	CC3: I am rewarded individually for my work efforts.					
Team Evaluation	CC4: The organization procedures are free of bias.					
	CC5: The organization procedures are applied consistently across all members of the team.					
	CC6: Decision makers provided team members with timely feedback about the decision and its implications.					
	CC7: Decision makers treated team members with kindness and considerations.					
Question 2:						
Leadership skills of Project Manager: These set of questions ask about the leadership skills of Project Manager.						
Motivation	L1: The project manager is helpful, supportive and motivates the team.					
Propensity to Trust	L2: The project manager has got general willingness to trust others.					
Mentor	L3: The project manager maintains tight logistical control.					
	L4: The project manager compares records or reports to detect discrepancies to assist team members with corrective measures.					

Section 3: Information about the dynamics and communication of Virtual Project Team.

This section focuses on the internal working of the team along with the characteristics of team members.

Kindly tick as per the below scale.

		Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Question 1:		**1**	**2**	**3**	**4**	**5**
Diversity of team: These set of questions ask about the diversification of team members with respect to their expertise and ethnicities and social backgrounds.						
Functional Diversity	DV1: Members of the team are similar in terms of their functional expertise.					
	DV2: Members of the team are similar in terms of their educational background.					
	DV3: Members of the team are different in terms of their length of organizational experience.					
Cultural Diversity	DV4: Members of team are culturally different					
Language Barriers	DV5: Members of team are same in their native language.					
Problem Solving Approach	DV6: Members of team differ in work ethics and their approach to problem solving.					
Question 2:						
Team Member Characteristics: These set of questions ask about the calculative and rational characteristics of team members.						
Cognitive Elements	TM1: The team members approach their job with professionalism and dedication.					
Ability	TM2: The team members exhibit technical or project competence.					
	TM3: The team members do not exhibit professional behaviour.					
Integrity	TM4: The team members are honest.					
	TM5: The team members are not virtuous.					
Benevolence	TM6: The team members take an extra effort to make your job easier.					
	TM7: The team members listened carefully to hear your problems or concerns.					
	TM8: The team members notified you when they could not meet a commitment.					
	TM9: The team members passed on new ideas that may be helpful to you or the group.					

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Question 3:		**1**	**2**	**3**	**4**	**5**
Task- Technology Fit: These set of questions ask about the nature of the tasks given to team members and its relationship with the technology.						
Task Complexity	TT1: The team members perform repetitive activities in doing their jobs.					
	TT2: There is a clearly defined body of knowledge of subject matter which can guide you in doing your work.					
Task Interdependence	TT3: Members of the team have to rely on information or material from others within the team.					
	TT4: Tasks performed by team members are related to one another.					
	TT5: Members have to obtain information and advice from other team members in order to complete the assigned task.					
Relationship of task and Technology	TT6: The project involved multiple technology platforms.					
	TT7: The project does not involve a lot of integration with other systems.					
Comfort with computers	TT8: I am comfortable using computer technology.					
Question 4:						
Cohesion of Team: These set of questions ask about team member relations within your team and the level of satisfaction of the team members.						
Respect	CO1: The team members respect each other.					
	CO2: The team members trust each other sufficiently to accurately share information, perceptions and feedback.					
Affective Elements	CO3: Team members in this team are considerate of other's feelings					
	CO4: Team members are friendly towards each other.					
	CO5: Team members can rely on fellow team members.					
	CO6: Members in the team are trustworthy.					
Employee Satisfaction	CO7: Team members are satisfied with the group's ability.					
	CO8: Team members are not satisfied with the commitment of the group.					
Cohesiveness	CO9: Our team is a very cohesive unit.					

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Question 5:		**1**	**2**	**3**	**4**	**5**
Conflict within the team: These set of questions ask about the expressed struggle among the team members.						
Conflict	CF1: The members disagree about the way to complete a team task.					
	CF2: There is an existence of a conflict about delegation of tasks in our team.					
	CF3: There are no differences of opinions regarding tasks.					
	CF4: There is friction and tension among members of the team.					
Question 6:						
Communication: These set of questions ask about the tools and technology your team uses and its method of communication.						
Communication Tool/ Type	CM1: The team is equipped with adequate tools and technologies to perform the tasks.					
Training	CM2: I receive sufficient training from the organization to develop my core skills.					
	CM3: Training is based on only technical skills such as using specific software applications or issues like product knowledge.					
	CM4: Training seminars are developed specifically to help us to communicate effectively with our fellow team members who work in dispersed locations.					

Please indicate the frequency with which you use the following tools for exchanging routine business information with fellow team members.

0 = Never/ Not Applicable 1= less than once a month 2= once a month

3 = Once a week 4= A few times a week 5= Daily

_____face –to- face interaction ____Group Telephone Conference _____Fax

_____Personal Telephone Call ____Video Conference _____E- mail

_____Voice Mail ____Shared Databases/ Groupware (e.g. LotusNotes)

_____Standard/ Express Mail Delivery _____ Other (Please Specify)

Thank you very much for your time and effort. Highly appreciated. Have an awesome day!

APPENDIX VII- RESPONSES OF PARTICIPANTS IN PILOT STUDY

Section 1: Demographics

This section asks you for general information about you and your team.

S.no.	Question	Participant #1	Participant #2	Participant #3	Participant #4	Participant #5	Participant #6	Participant #7
1	Age	Fine	Fine	Fine	Fine	Fine	Fine	Fine
2	Gender	Fine	Fine	Fine	Fine	Fine	Fine	Fine
3	Education Qualification	Fine	Include Diploma in qualifications	Ph. D's are rare in construction sector. You can omit this, instead include diploma / ITI.	Include Diploma in qualifications . In fact Ph. D are very less in construction sector	Fine	Include Diploma in qualifications	Include Diploma in qualifications. In fact Ph. D are very less in construction sector
4	Experience in virtual team	Fine	Total experience or experience in current team.	Fine	Fine	Total experience or experience in current team.	Total experience or experience in current team.	Total experience or experience in current team.
5	Team Size	Average or current	Fine	Average or current size	Average or current	Average or current	Fine	Average or current

				you worked or managed.				
6	Team Tenure	Average or current	Average or current	Average or current	Fine	Average or current	Fine	Average or current
7	Position in team	Fine	fine	Role Played in the team	Elaborate what do you mean by this	Role Played in the team	fine	You can ask their position in team.
8	Native Country	Not needed	fine	Are you in same nationality since birth or taken new passport?	Does not matter, which nationality	Remove	Redundant	What if somebody is Indian and taken British passport?

Section 2: Information about the corporate culture and leadership skills of the project manager

S.no.	**Question**	**Participant #1**	**Participant #2**	**Participant #3**	**Participant #4**	**Participant #5**	**Participant #6**	**Participant #7**
Question 1:								
Corporate Culture: These set of questions ask about the characteristics of your job and organizational environment in which your team operates.								
1. Clear Objectives and Goals	CC1: My role in the team was clearly explained to me during formation of team.	Fine	Fine	Fine	Are roles and expectations same?	Fine	Fine	Instead of Corporate culture write Organization culture.
2. Recruitment	CC2: Team members are	Fine	Write virtual	Fine	Fine	Fine	Fine	Fine

Strategy	selected based on their individual talents and abilities to contribute to the team.		project team members.					
3.Rewards	CC3: I am rewarded individually for my work efforts.	Fine	Fine	Fine	Fine	Fine	Fine	Fine
4.Team Evaluation	CC4: The organization procedures are free of bias.	Fine	Not needed, as you will not get honest response	Fine	It's no help here, so remove	Sometimes biasing happens.	Not needed	Need to clarify 'bias about what'
	CC5: The organization procedures are applied consistently across all members of the team.	Fine	For what is this needed	Fine	Fine	Sometimes biasing happens.	Fine	Elaborate
	CC6: Decision makers provided team members with timely feedback about the decision and its implications.	Fine	Seems CC5 is also talking about this.	Simple language is needed.	CC5 and CC6 can be combine	Fine	Fine	Combine 5 and 6
	CC7: Decision makers treated team members with kindness and considerations.	Not needed	Fine	Not needed.	Fine	Remove	Remove	Redundant

S.no.	Question	Participant #1	Participant #2	Participant #3	Participant #4	Participant #5	Participant #6	Participant #7
Question 2:								
Leadership skills of Project Manager: These set of questions ask about the leadership skills of Project Manager.								
1. Motivation	L1: The project manager is helpful, supportive and motivates the team.	Motivates is correct word to be used.	Motivates is correct word to be used.	Remove helpful and supportive as both of them is inclusive of motivate.	Fine	Fine	Motivates is correct word to be used.	3 items in a single question, not needed. Motivates is enough
2. Propensity to Trust	L2: The project manager has got general willingness to trust others.	Write in general : superior or supervisor	Fine	Instead of project manager, write supervisor or superior.	Fine	Superior is better word	Fine	Instead of project manager, write supervisor or superior.
3. Mentor	L3: The project manager maintains tight logistical control.	Not required	Remove	Make this in simple wording.	Explain logistical control; simple wording is required	No information can be extracted from this	Can be removed	Explain logistical control; simple wording is required
	L4: The project manager compares records or reports to detect discrepancies to assist team members with corrective measures.	Simple wording is required	Fine	Fine	Fine	Fine	Can add Plan, Execute, Monitor and Controls	Fine

Section 3: Information about the dynamics and communication of Virtual Project Team. This section focuses on the internal working of the team along with the characteristics of team members.

S.no.	Question	Participant #1	Participant #2	Participant #3	Participant #4	Participant #5	Participant #6	Participant #7
Question 1:								
Diversity of team: These set of questions ask about the diversification of team members with respect to their expertise and ethnicities and social backgrounds.								
1. Functional Diversity	DV1: Members of the team are similar in terms of their functional expertise.	Functional Expertise are not same; within project different skill set is required.	Fine	Fine	Fine	Fine	Fine	Fine
	DV2: Members of the team are similar in terms of their educational background.	Fine	Fine	Fine	Fine	Fine	Fine	Fine
	DV3: Members of the team are different in terms of their length of organizational experience.	Fine	Fine	Fine	Fine	Fine	Fine	Fine
2. Cultural Diversity	DV4: Members of team are culturally different	Introduce the problem here.	Fine	Fine	Then what.	Fine	Can be combined with next item.	Can be more specific
3. Language Barriers	DV5: Members of team are same in their native language.	Fine	Combine DV4 and DV5	Fine	There is a connection in	Fine	May ask: ability to	Fine

					DV4 and DV5		communicate in English both verbal and written	
4. Problem Solving Approach	DV6: Members of team differ in work ethics and their approach to problem solving.	Fine	Fine	Fine	Fine	Fine	Fine	Can be more specific

S.no.	**Question**	**Participant #1**	**Participant #2**	**Participant #3**	**Participant #4**	**Participant #5**	**Participant #6**	**Participant #7**
Question 2:								
Team Member Characteristics: These set of questions ask about the calculative and rational characteristics of team members.								
1. Cognitive Elements	TM1: The team members approach their job with professionalism and dedication.	Fine	Fine	Change ' approach' to 'preform'	Fine	Fine	Fine	Fine
2. Ability	TM2: The team members exhibit technical or project competence.	Fine	Fine	Remove project competence; technical competence is enough.	Fine	Fine	Fine	Fine
	TM3: The team members do not exhibit professional behaviour.	Not needed here	Fine	Similar to TM1	Fine	Not needed here	Similar to TM1	Delete
3. Integrity	TM4: The team members are honest.	Fine	Fine	Fine	Fine	Fine	Fine	Fine
	TM5: The team members are not virtuous.	Remove	Remove	Similar to	Remove	Fine	Similar to	Remove

				TM4 not much difference.			TM4 not much difference.	
4. Benevolence	TM6: The team members take an extra effort to make your job easier.	Fine	Fine	Fine	For this point, you can have one item	Gender bias is there.	Fine	Reword
	TM7: The team members listened carefully to hear your problems or concerns.	Fine	Fine	Correct it to listens.	Fine	Same meaning of TM6,7, and 8.	Fine	Fine
	TM8: The team members notified you when they could not meet a commitment.	You can combine all the three.	Fine	Fine	Fine	Fine	Fine	Fine
	TM9: The team members passed on new ideas that may be helpful to you or the group.	Fine	Fine	Basically its talking about help to others, you can have one item.	Fine	Fine	Combine all the four, generate one.	Fine

S.no.	**Question**	**Participant #1**	**Participant #2**	**Participant #3**	**Participant #4**	**Participant #5**	**Participant #6**	**Participant #7**
Question 3:								
Task- Technology Fit: These set of questions ask about the nature of the tasks given to team members and its relationship with the technology.								
1. Task Complexity	TT1: The team members perform repetitive activities in doing their jobs.	Repetitive but activities need to be customized.	Fine	Fine	Fine	Not entirely repetitive, but somewhat.	Fine	Fine
	TT2: There is a clearly	Fine	No need	What is body	Fine	Simplify this	In	Remove

	defined body of knowledge of subject matter which can guide you in doing your work.			of knowledge? Put it in simpler words.		question.	construction sector, it does not help.	
2. Task Interdependence	TT3: Members of the team have to rely on information or material from others within the team.	Fine	Yu can combine all the three items	Fine	Fine	Fine	Are these questions specific to project?	Combine this item with the next two.
	TT4: Tasks performed by team members are related to one another.	Fine	Fine	Fine	Fine	Fine	Fine	Fine
	TT5: Members have to obtain information and advice from other team members in order to complete the assigned task.	Fine	Very important	Fine	Combine with the above two.	Very much necessary to build trust	Fine	Fine
3. Relationship of task and Technology	TT6: The project involved multiple technology platforms.	Fine	Platforms are fine. Nobody bothers	Reframe it.	Fine	These days platforms does not matter.	Fine	Fine
	TT7: The project does not involve a lot of integration with other systems.	Fine	Fine	What are systems? Explain.	Fine	Fine	Elaborate systems.	Fine
4.Comfort with computers	TT8: I am comfortable using computer technology.	Not required. Remove	Not required.	Delete it.	Delete it.	Not needed in today's world.	Not required.	Not needed in these times.

S.no.	Question	Participant #1	Participant #2	Participant #3	Participant #4	Participant #5	Participant #6	Participant #7
Question 4:								
Cohesion of Team: These set of questions ask about team member relations within your team and the level of satisfaction of the team members.								
1. Respect	CO1: The team members respect each other.	Fine	Fine	Fine	Fine	Fine	Fine	Fine
	CO2: The team members trust each other sufficiently to accurately share information, perceptions and feedback.	Fine	Not required here.	Write till information, no need of other two components.	Fine	You can put this question in trust .	Fine	Fine
2. Affective Elements	CO3: Team members in this team are considerate of other's feelings	Fine	Fine	Fine	Reword	Fine	Fine	Fine
	CO4: Team members are friendly towards each other.	Fine	Same meaning as above	Fine	Fine	Fine	Can combine with the above item.	Fine
	CO5: Team members can rely on fellow team members.	Remove	Fine	Remove	Fine	Omit	Delete	Not needed
	CO6: Members in the team are trustworthy.	Fine	Put it in trust.	Fine	Use it in trust.	Can be used somewhere else	Fine	Not needed here.
3. Employee Satisfaction	CO7: Team members are satisfied with the group's ability.	Fine	Fine	Fine	Fine	Fine	Fine	Fine
	CO8: Team members are not satisfied with the commitment of the group.	Same as above, remove	Fine	Not needed. same	Fine	Redundant	Remove	Fine

4. Cohesiveness	CO9: Our team is a very cohesive unit.	Remove	Fine	Not needed	Fine	It would be calculated from the above items	Fine	It has to come from answers from above items.

S.no.	**Question**	**Participant #1**	**Participant #2**	**Participant #3**	**Participant #4**	**Participant #5**	**Participant #6**	**Participant #7**
Question 5:								
Conflict within the team: These set of questions ask about the expressed struggle among the team members.								
1. Conflict	CF1: The members disagree about the way to complete a team task.	Very important for trust	Fine	Explain ' about the way'.	Fine	Important for trust.	Fine	To address conflict, it's very important for building trust
	CF2: There is an existence of a conflict about delegation of tasks in our team.	Very important for trust	Fine	Simple words.	Fine	Fine	Fine	Fine
	CF3: There are no differences of opinions regarding tasks.	Not needed	Fine	Redundant	Remove	Fine	Same as above	Fine
	CF4: There is friction and tension among members of the team.	Very important for trust	Fine	Fine	Fine	Very important to know this	Fine	Fine
Question 6:								
Communication: These set of questions ask about the tools and technology your team uses and its method of communication.								
1. Communication Tool/ Type	CM1: The team is equipped with adequate tools and technologies to perform the tasks.	Fine	Fine	Write virtual project teams not just team.	Fine	Fine	Fine	Fine

2.Training	CM2: I receive sufficient training from the organization to develop my core skills.	Fine	Fine	To update core skills.	Fine	Fine	Fine	Fine
	CM3: Training is based on only technical skills such as using specific software applications or issues like product knowledge.	Fine	Fine	Fine	Write training on engineering softwares ; they can be anything	Training is very much needed.	Fine	Fine
	CM4: Training seminars are developed specifically to help us to communicate effectively with our fellow team members who work in dispersed locations.	Can combine it with above item.	Fine	Write remote or geographically with dispersed locations.	Fine	Fine	Combine with CC3.	CC3 +CC4

S.no.	**Question**	**Participant #1**	**Participant #2**	**Participant #3**	**Participant #4**	**Participant #5**	**Participant #6**	**Participant #7**
Question 7:								
Trust Among team members of Virtual Project team: Trust refers to the likelihood that team members will live up to their colleagues' expectations.								
Trust	T1: I was comfortable accepting procedural suggestions from other team members.	Fine	Fine	Fine	Fine	Fine	Fine	Fine
	T2: I was confident relying on the information that other team members brought to the discussion.	Fine	Fine	Fine	Fine	Fine	Fine	Fine
	T3: When other members gave information, I wanted to double-check it for myself. (reversed)	Fine	Fine	Fine	Fine	Fine	Fine	Fine
	T4: I did not have much faith in other members' "expertise." (reversed)	Fine	Fine	Fine	Fine	Fine	Fine	Fine

1. Were the questions clear and understandable?
   a) Not at all b) Only a little c) Quite a lot d) A great deal

Participant #1	Participant #2	Participant #3	Participant #4	Participant #5	Participant #6	Participant #7
c)	List of few definitions are appreciated.	c)	d)	d)	c) , but few definitions would help	d)

2. What do you think about the wording of questions?

a) Not complex b) Little complex c) More complex d) Most Complex- not understandable

Participant #1	Participant #2	Participant #3	Participant #4	Participant #5	Participant #6	Participant #7
Clarity required at one or two places.	b)	c), Few places, make simple wordings	b)	At few places, the wordings are two technical.	b)	Rewording at few places

3. The concept of research was clearly understood by the nature of questions.

a) Yes, definitely b)Yes, sometimes c) No, not much d) No, not at all

Participant #1	Participant #2	Participant #3	Participant #4	Participant #5	Participant #6	Participant #7
a)	a)	b)	a)	b)	a)	b)

4. What do you think about the length of the questionnaire?
   a) Longer than expected b) fine c) shorter than expected

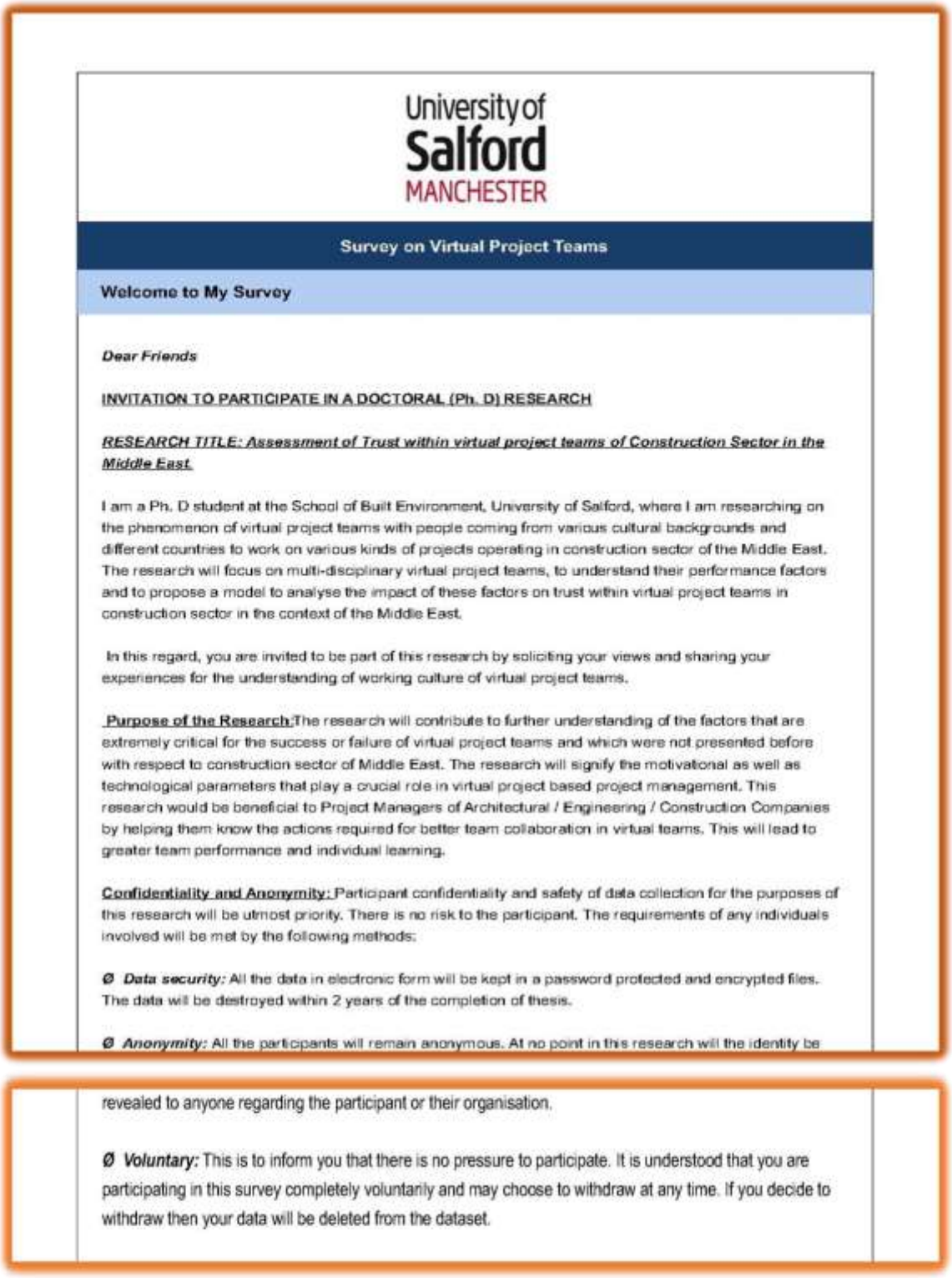
Participant #1	Participant #2	Participant #3	Participant #4	Participant #5	Participant #6	Participant #7
b)	b)	a)	Fine	b)	b)	a)

5. The total time taken to fill the questionnaire was :

a) 15- 20 minutes b) 21- 25 minutes c) 26 – 30 minutes d)31-35minutes

Participant #1	Participant #2	Participant #3	Participant #4	Participant #5	Participant #6	Participant #7
d)	c)	d)	More than 35 minutes	d)	d)	d)

APPENDIX VIII - WEB – BASED QUESTIONNAIRE



University of Salford MANCHESTER

Survey on Virtual Project Teams

Welcome to My Survey

Dear Friends

INVITATION TO PARTICIPATE IN A DOCTORAL (Ph. D) RESEARCH

RESEARCH TITLE: Assessment of Trust within virtual project teams of Construction Sector in the Middle East

I am a Ph. D student at the School of Built Environment, University of Salford, where I am researching on the phenomenon of virtual project teams with people coming from various cultural backgrounds and different countries to work on various kinds of projects operating in construction sector of the Middle East. The research will focus on multi-disciplinary virtual project teams, to understand their performance factors and to propose a model to analyse the impact of these factors on trust within virtual project teams in construction sector in the context of the Middle East.

In this regard, you are invited to be part of this research by soliciting your views and sharing your experiences for the understanding of working culture of virtual project teams.

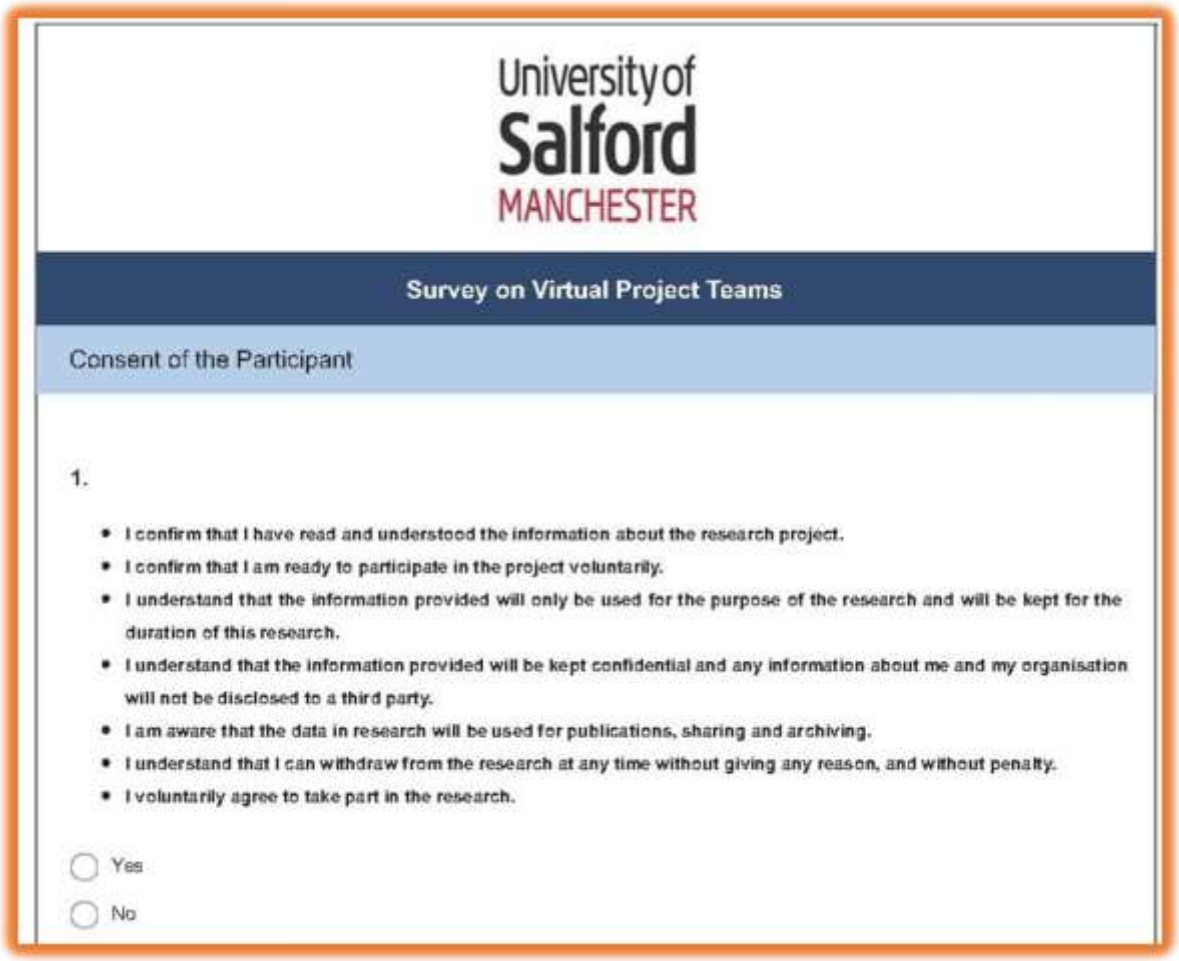
Purpose of the Research: The research will contribute to further understanding of the factors that are extremely critical for the success or failure of virtual project teams and which were not presented before with respect to construction sector of Middle East. The research will signify the motivational as well as technological parameters that play a crucial role in virtual project based project management. This research would be beneficial to Project Managers of Architectural / Engineering / Construction Companies by helping them know the actions required for better team collaboration in virtual teams. This will lead to greater team performance and individual learning.

Confidentiality and Anonymity: Participant confidentiality and safety of data collection for the purposes of this research will be utmost priority. There is no risk to the participant. The requirements of any individuals involved will be met by the following methods:

Ø ***Data security:*** All the data in electronic form will be kept in a password protected and encrypted files. The data will be destroyed within 2 years of the completion of thesis.

Ø ***Anonymity:*** All the participants will remain anonymous. At no point in this research will the identity be revealed to anyone regarding the participant or their organisation.

Ø ***Voluntary:*** This is to inform you that there is no pressure to participate. It is understood that you are participating in this survey completely voluntarily and may choose to withdraw at any time. If you decide to withdraw then your data will be deleted from the dataset.



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Survey on Virtual Project Teams

Consent of the Participant

1.

- I confirm that I have read and understood the information about the research project.
- I confirm that I am ready to participate in the project voluntarily.
- I understand that the information provided will only be used for the purpose of the research and will be kept for the duration of this research.
- I understand that the information provided will be kept confidential and any information about me and my organisation will not be disclosed to a third party.
- I am aware that the data in research will be used for publications, sharing and archiving.
- I understand that I can withdraw from the research at any time without giving any reason, and without penalty.
- I voluntarily agree to take part in the research.

◯ Yes

◯ No

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Survey on Virtual Project Teams

Section 1: Demographics

This section asks you for general information about you and your virtual project team.
[Virtual project teams are defined as as teams whose members use technology to varying degrees in working across locational, temporal, and relational boundaries to accomplish an interdependent task.

1. Locational means physical dispersion of team members, such as different geographic locations or different workplaces at the same geographic location.
2. The temporal boundary encompasses lifecycle and synchronicity. Lifecycle captures the extent to which a team is temporary or ongoing, while synchronicity refers to the timing of member interaction on the group's task.
3. The relational boundary refers to the differences in relational networks of VT members, that is, their affiliations with other teams, departments, organizations, and cultural sub-groups.]

2. Age

3. Gender

- ◯ Male
- ◯ Female

4. Educational Qualifications

- ◯ Certificate Course
- ◯ Diploma
- ◯ Bachelor's Degree
- ◯ Master's Degree

5. Total experience of working in virtual project team (in years)

6. Average size of virtual project team you have worked in

[Size refers to the average number of members in the various teams you have worked in.]

7. Average tenure of virtual project teams

[Tenure refers to the average life of the team in years: for example, you may have worked in one team for 3 years and another team for 5 years, the average tenure of teams would come out to be 4 years.]

8. Your position in virtual project team

[Please select any one of the below option irrespective of your designation in the company]

- ○ Team Member
- ○ Team Leader

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Survey on Virtual Project Teams

Section 2: Organizational Culture and Leadership skills of your superior

This page asks the information about the organizational culture and leadership skills of your superior.

9.

Organizational Culture:

These set of questions ask about the characteristics of your job and organizational environment in which your team operates.

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
My role in the virtual project team was clearly explained to me during formation of team.	○	○	○	○	○
Virtual project team members are selected based on their individual talents and abilities to contribute to the team.	○	○	○	○	○
I am rewarded individually for my work efforts.	○	○	○	○	○
The organization procedures are applied consistently to all members for the evaluation of virtual project team.	○	○	○	○	○

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Survey on Virtual Project Teams

Section 2: Organizational Culture and Leadership skills of your superior

10.

Leadership skills of your superior:

These set of questions ask about the leadership skills of your superior.

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
My superior motivates the team.	○	○	○	○	○
My superior has got general willingness to trust others.	○	○	○	○	○
My superior compares records or reports to detect discrepancies to assist team members with corrective measures.	○	○	○	○	○

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Survey on Virtual Project Teams

Section 3: Information about the dynamics and communication of Virtual Project Team.

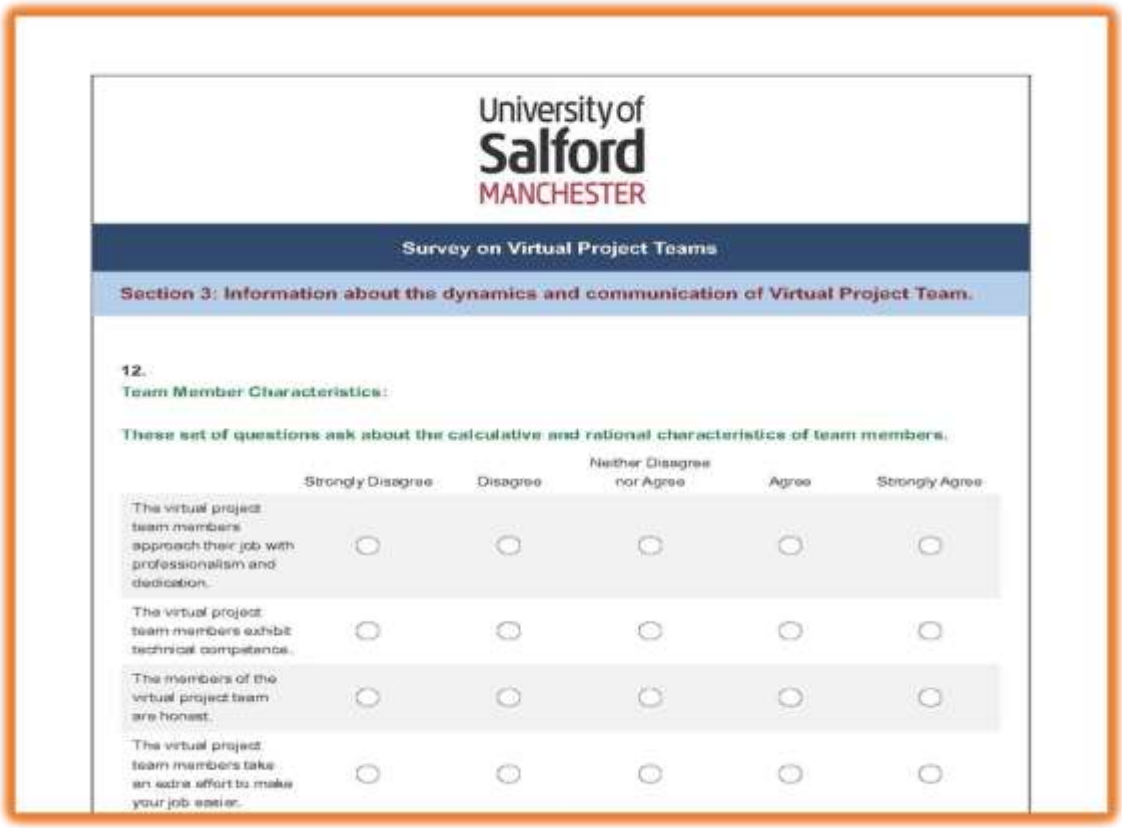
This section focuses on the internal working of the team along with the characteristics of team members.

11.

Diversity of team:

These set of questions ask about the diversification of team members with respect to their expertise, experience and cultural backgrounds.

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
Members of the virtual project team are similar in terms of their functional expertise. [It means that the members are having similar knowledge for performing their tasks in the team.]	○	○	○	○	○
Members of the virtual project team are different in terms of their years of organizational experience.	○	○	○	○	○
The cultural diversity of virtual project team members introduces language barriers in the team.	○	○	○	○	○
Members of team differ in work ethics and their approach to problem solving.	○	○	○	○	○



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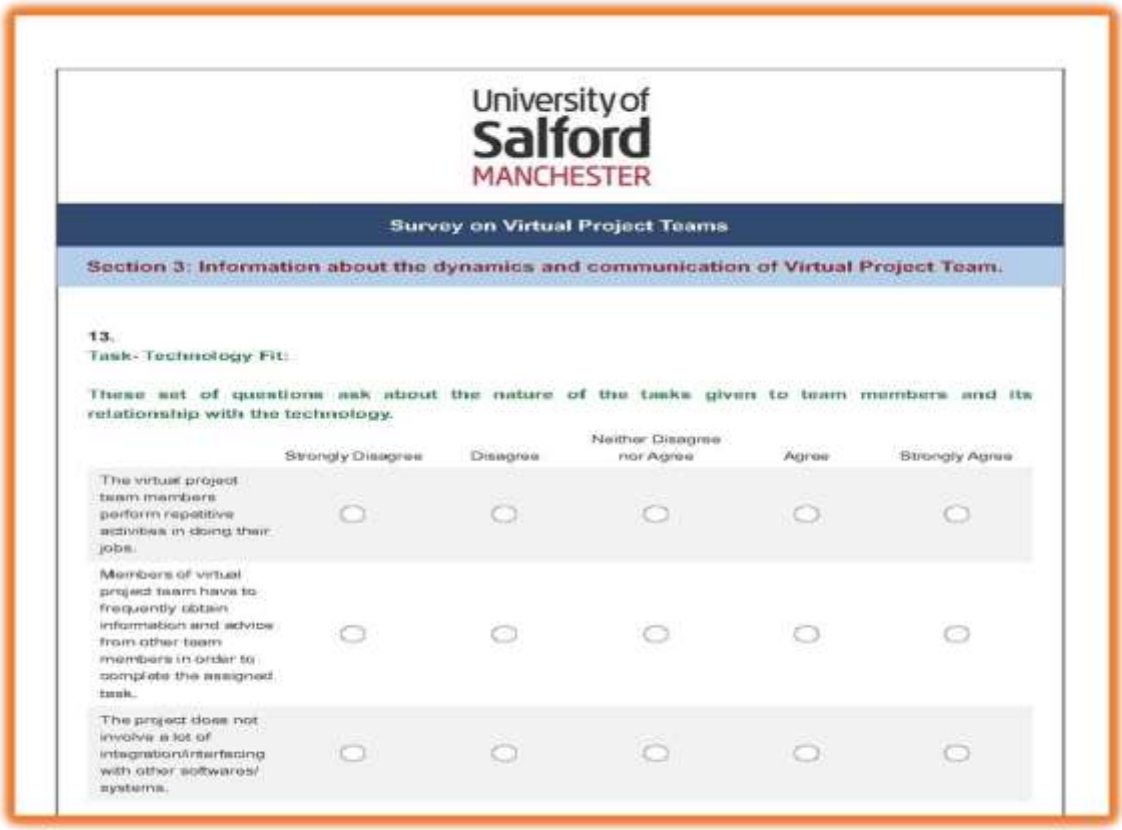
Survey on Virtual Project Teams

Section 3: Information about the dynamics and communication of Virtual Project Team.

12.
Team Member Characteristics:

These set of questions ask about the calculative and rational characteristics of team members.

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
The virtual project team members approach their job with professionalism and dedication.	○	○	○	○	○
The virtual project team members exhibit technical competence.	○	○	○	○	○
The members of the virtual project team are honest.	○	○	○	○	○
The virtual project team members take an extra effort to make your job easier.	○	○	○	○	○



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Survey on Virtual Project Teams

Section 3: Information about the dynamics and communication of Virtual Project Team.

13.
Task- Technology Fit:

These set of questions ask about the nature of the tasks given to team members and its relationship with the technology.

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
The virtual project team members perform repetitive activities in doing their jobs.	○	○	○	○	○
Members of virtual project team have to frequently obtain information and advice from other team members in order to complete the assigned task.	○	○	○	○	○
The project does not involve a lot of integration/interfacing with other softwares/ systems.	○	○	○	○	○

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Survey on Virtual Project Teams

Section 3: Information about the dynamics and communication of Virtual Project Team.

14.
Cohesion of Team:

These set of questions ask about the relation amongst the team members and their level of satisfaction in working within the team.

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
The members of your team respect each other.	○	○	○	○	○
Members in your team are considerate of other's feelings.	○	○	○	○	○
Team members are not satisfied with the commitment of the group.	○	○	○	○	○

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Survey on Virtual Project Teams

Section 3: Information about the dynamics and communication of Virtual Project Team.

15.
Conflict within the team:

These set of questions talks about disagreement or argument among team members with opposing opinions or principles.

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
The members disagree on the approach to complete the team task.	○	○	○	○	○
There is an existence of a conflict about delegation of tasks in the team.	○	○	○	○	○
There is friction and tension among members of the team.	○	○	○	○	○

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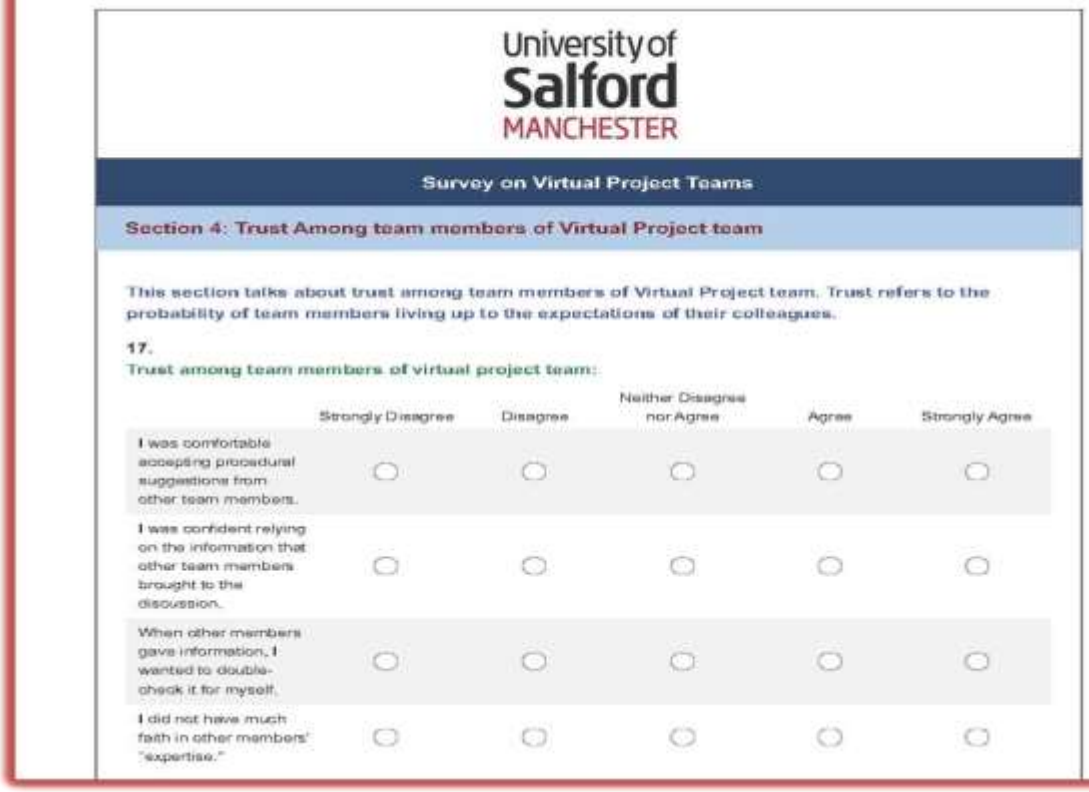
Survey on Virtual Project Teams

Section 3: Information about the dynamics and communication of Virtual Project Team.

16.
Communication:

These set of questions ask about the communication tools and technology used by the team.

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
The team is equipped with adequate communication tools and technologies to perform their tasks.	○	○	○	○	○
There is a time and holiday difference among countries, which results in delay in communication of project information.	○	○	○	○	○
I receive training on improving my technical skills such as using specific engineering and document control softwares.	○	○	○	○	○
Training seminars are developed specifically to help us to communicate effectively with our fellow team members who work in geographically dispersed locations.	○	○	○	○	○



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Survey on Virtual Project Teams

Section 4: Trust Among team members of Virtual Project team

This section talks about trust among team members of Virtual Project team. Trust refers to the probability of team members living up to the expectations of their colleagues.

17.
Trust among team members of virtual project team:

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
I was comfortable accepting procedural suggestions from other team members.	○	○	○	○	○
I was confident relying on the information that other team members brought to the discussion.	○	○	○	○	○
When other members gave information, I wanted to double-check it for myself.	○	○	○	○	○
I did not have much faith in other members' "expertise."	○	○	○	○	○

APPENDIX IX – REFINED QUESTIONNAIRE

Q U E S T I O N N A I R E

The questionnaire consists of the following sections:

Section 1: Demographics

Section 2: Information about the Company Environment

Section 3: Information about the dynamics and communication of Virtual Project Team.

DIRECTIONS

The virtual team survey will take approximately 20- 25 minutes to complete. Please follow the instructions on the survey itself and indicate your responses accordingly.

Section 1: Demographics

This section asks you for general information about you and your team.

1 Age	_____years
2 Gender (Put a tick mark against valid option)	( ) Male ( ) Female
3 Education Qualification 4 (Put a tick mark against valid option)	( ) Certificate Course ( ) Diploma ( ) Bachelor's Degree ( ) Master's Degree
5 Total experience of working in virtual project team (in years)	_____years
6 Average size of virtual project team you have worked in **[Size refers to the average number of members in the various teams you have worked in.]**	_____
7 Average tenure of virtual project teams **[Tenure refers to the average life of the team in years: for example, you may have worked in one team for 3 years and another team for 5 years, the average tenure of teams would come out to be 4 years.]**	_____years
8 Your position in virtual project team	Team Member ____

[Please select any one of the below option irrespective of your designation in the company]	4. Team Leader _____

Section 2: Information about the organizational culture and leadership skills of your superior.

Kindly tick as per the below scale.

		Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Question 1:		**1**	**2**	**3**	**4**	**5**
Organizational Culture: These set of questions ask about the characteristics of your job and organizational environment in which your team operates.						
Clear Objectives and Goals	CC1: My role in the virtual project team was clearly explained to me during formation of team.					
Recruitment Strategy	CC2: Virtual project team members are selected based on their individual talents and abilities to contribute to the team.					
Rewards	CC3: I am rewarded individually for my work efforts.					
Team Evaluation	CC4: The organization procedures are applied consistently to all members for the evaluation of virtual project team.					
Question 2:						
Leadership skills of your superior: These set of questions ask about the leadership skills of your superior.						
Motivation	L1: My superior motivates the team.					
Propensity to Trust	L2: My superior has got general willingness to trust others.					
Mentor	L3: My superior compares records or reports to detect discrepancies to assist team members with corrective measures.					

Section 3: Information about the dynamics and communication of Virtual Project Team. This section focuses on the internal working of the team along with the characteristics of team members.

Kindly tick as per the below scale.

		Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Question 1:		**1**	**2**	**3**	**4**	**5**
Diversity of team: These set of questions ask about the diversification of team members with respect to their expertise, experience and cultural backgrounds.						
Functional	DV1: Members of the virtual					

Diversity	project team are similar in terms of their functional expertise. [It means that the members are having similar knowledge of performing their tasks in the team]					
	DV2: Members of the virtual project team are different in terms of their years of organizational experience.					
Cultural Diversity	DV3: The cultural diversity of virtual project team members introduces language barriers in the team.					
Problem Solving Approach	DV4: Members of team differ in work ethics and their approach to problem solving.					
		Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Question 2:		**1**	**2**	**3**	**4**	**5**
Team Member Characteristics: These set of questions ask about the calculative and rational characteristics of team members.						
Cognitive Elements	TM1: The virtual project team members approach their job with professionalism and dedication.					
Ability	TM2: The virtual project team members exhibit technical competence.					
Integrity	TM3: The members of the virtual project team are honest.					
Benevolence	TM4: The virtual project team members take an extra effort to make your job easier.					
Question 3:						
Task- Technology Fit: These set of questions ask about the nature of the tasks given to team members and its relationship with the technology.						
Task Complexity	TT1: The virtual project team members perform repetitive activities in doing their jobs.					
Task Interdependence	TT2: Members of virtual project team have to frequently obtain information and advice from other team members in order to complete the assigned task.					
Relationship of task and Technology	TT3: The project does not involve a lot of integration/interfacing with other software/ systems. (reversed)					
Question 4:						
Cohesion of Team: These set of questions ask about the relation amongst the team members and their level of satisfaction in working within the team.						
Respect	CO1: The members of your team respect each other.					
Affective Elements	CO2: Members in your team are considerate of other's feelings					

Employee Satisfaction	CO3: Team members are not satisfied with the commitment of the group. (reversed)					
Question 5:						
Conflict within the team: These set of questions talks about disagreement or argument among team members with opposing opinions or principles.						
Conflict	CF1: The members disagree on the approach to complete the team task. (reversed)					
	CF2: There is an existence of a conflict about delegation of tasks in the team.					
	CF3: There is friction and tension among members of the team.					
Question 6:						
Communication: These set of questions ask about the communication tools and technology used by the team.						
Communication Tool/ Type	CM1: The team is equipped with adequate communication tools and technologies to perform their tasks.					
Time difference and holidays	CM2: There is a time and holiday difference among countries, which results in delay in communication of project information.					
Training	CM3: I receive training on improving my technical skills such as using specific engineering and document control software.					
	CM4: Training seminars are developed specifically to help us to communicate effectively with our fellow team members who work in geographically dispersed locations.					
Section 4: Trust Among team members of Virtual Project team:						
This section talks about trust among team members of Virtual Project team. Trust refers to the probability of team members living up to the expectations of their colleagues.						
Trust	T1: I was comfortable accepting procedural suggestions from other team members.					
	T2: I was confident relying on the information that other team members brought to the discussion.					
	T3: When other members gave information, I wanted to double-check it for myself. (reversed)					
	T4: I did not have much faith in other members' "expertise." (reversed)					

Thank you very much for your time and effort. Highly appreciated. Have an awesome day!

APPENDIX X- QUESTIONNAIRE REFERENCE TABLE

Section 2: Information about the organizational culture and leadership skills of your superior.

Question 1:			**Reference**	
Organizational Culture: These set of questions ask about the characteristics of your job, selection of team members, incentives and organizational environment in which your team operates.			**S. Furst, R. Blackburn, B. Rosen(1999);A. Diallo, D. Thuillier(2005);Chad Lin, C. Standing , Ying-Chieh(2008);Dorairaj, S., Noble, J. & Malik, P., (2012);Brown, P.(2010);Kasper-Fuehrera, E. & Ashkanasy, N.(2001);Verburg, R.M., Bosch-sijtsema, P. & Vartiainen, M(2013);Rusman, E. et al.(2010);Wong, W. et al.(2008);C. Kimble(2011);Kadefors, A(2004);Tran, F.Y.Y.L.H.B.T(2012);Lau, E. & Rowlinson, S(2009);**	
Variable	**Item**	**Reason**	**Reference of the item**	**References in the literature**
1. Clear Objectives and Goals	CC1: My role in the virtual project team was clearly explained to me during formation of team.	The clear understanding of goals leads to better understanding of what is expected of the team members.	Jeremy S. Lurey, Mahesh S. Raisinghani (2001)	N. Abu Mansor, S. Mirahsani (2012);T. Brahm, F. Kunze (2012);Yu-Ting C. Hung, A. R. Dennis, L. Robert (2004);P.Ferreira, E.Lima, S. da Costa(2012);E. Amah, C. A. Nwuche, N. Chukuigwe(2013);S. Raghuram, R. Garud, B. Wiesenfeld, V. Gupta (2001);N. A.Ebrahim, S. Ahmed, Z. Taha(2009);B. Munkvold, I. Zigurs(2007);Prasad, K. & Akhilesh, K.B(2002);Bergiel, E.B. & Balsmeirer, P.W.(2008);Lee-Kelley, L. & Sankey, T., (2008);Verburg, R.M., Bosch-sijtsema, P. & Vartiainen, M(2013);Mancini, D.(2010);Management, P. & Culture, O.(2014);Germain, M.-L(2011);Christoph Clases, Renhard Bachmann and Wehner, T.(2004);

2. Recruitment Strategy	CC2: Virtual project team members are selected based on their individual talents and abilities to contribute to the team.	Refers to the recruitment of people who possess interpersonal skills in addition to technical skills that will enable them to be better team players.	Jeremy S. Lurey, Mahesh S. Raisinghani (2001)	N. Abu Mansor, S. Mirahsani (2012);Jeremy S. Lurey,Mahesh S. Raisinghani(2001);E. Amah, C. A. Nwuche, N. Chukuigwe(2013);N. A.Ebrahim, S. Ahmed, Z. Taha(2009);A. Diallo, D. Thuillier(2005);
3. Rewards	CC3: I am rewarded individually for my work efforts.	Refers to incentive in terms of recognition in company newsletters or monetary benefits based on individual and team performance. This greatly motivates the team member and which leads to better performance	Jeremy S. Lurey, Mahesh S. Raisinghani (2001)	N. Abu Mansor, S. Mirahsani (2012);Jeremy S. Lurey,Mahesh S. Raisinghani(2001);E. Amah, C. A. Nwuche, N. Chukuigwe(2013);N. A.Ebrahim, S. Ahmed, Z. Taha(2009);S. Furst, R. Blackburn, B. Rosen(1999);S. M. Bryant , S. M. Albring, U. Murthy(2009);Nguyen, P., Babar, M. & Verner, J.(2006);Kadefors, A(2004);Tran, F.Y.Y.L.H.B.T(2012);Lau, E. & Rowlinson, S(2009);
4. Team Evaluation	CC4: The organization procedures are applied consistently to all members for the evaluation of virtual project team.	Refers to mechanism for dealing with diverse uncertain circumstances such as the virtual context. Team Evaluation can be broken down into four empirically separate dimensions: **Distributive justice** (fairness of outcomes), **Procedural justice** (fairness of decision-making procedures), **Interpersonal justice** (fairness of interpersonal treatment),	Dayan & Benedetto, (2010)	S. Furst, R. Blackburn, B. Rosen(1999);Fang, Y. & Chiu, C., (2010);

		and **Informational justice** (adequacy of information about decision-making procedures and outcome distribution)		

Question 2:			**Reference**	
Leadership skills of the superior: These set of questions ask about the leadership skills of your superior.			**E. Amah, C. A. Nwuche, N. Chukuigwe(2013);Jeremy S. Lurey,Mahesh S. Raisinghani(2001);S. Chi, M. Yang, C. Tsou(2004);J. Daspit C., J. Tillman ,N. G. Boyd ,V. Mckee(2013);Daim, T., Ha, A. & Reutiman, S.,(2012);Xiao, W. & Wei, Q.(2008);Bergiel, E.B. & Balsmeirer, P.W.(2008);Horwitz, F.M., Desmond, B. & Ulrik, S.(2006);Management, P. & Culture, O.(2014);Management, P. & Policies, H.R(2014);Bao, G.M. et al.(2004);Chutnik, M. & Grzesik, K.(2009);Dakrory, M. & Abdou, H.(2009);Pierce, E., & Hansen, S. (2013);Bell, B. & Kozlowski, S(2002);Nancy Penland Jenster(2009);**	
Variable	**Item**	**Reason**	**Reference of the item**	**References in the literature**
1. Motivation	L1: My superior motivates the team.	The concern and support of superior highly motivates the team members and it leads to greater understanding of relationships.	Jeremy S. Lurey, Mahesh S. Raisinghani (2001)	Qi, L., Wang, K. & Ma, Z.(2010);Brown, P.(2010);Nancy Penland Jenster(2009);
2. Propensity to Trust	L2: My superior has got general willingness to trust others.	Refers to 'general willingness to trust others''. It will influence how much trust one has for a trustee prior to data on that particular party being	Ridings, Gefen, & Arinze, (2002)	Eric W. Kuo, L. Thompson(2014);B. A. AUBERT, B. L. KELSEY(2003);SIRKKA L. JARVENPAA, K. KNOLL,D. E. LEIDNER (1998);Lee, H. et al.(2014);

		available.		
3. Mentor	L3: My superior compares records or reports to detect discrepancies to assist team members with corrective measures.	It is considered as Team monitoring which is a process of observing actions of teammates and watching for errors or performance discrepancies so that suggestions or corrective feedback can be provided to assist team members. More team monitoring sometimes leads to negativity among the team members and distrust arises	Wakefield, Leidner, & Garrison (2008)	B. A. DE JONG, T. ELFRING(2010)

Section 3: Information about the dynamics and communication of Virtual Project Team. This section focuses on the internal working of the team along with the characteristics of team members.

Question 1:			**Reference**	
Diversity of team: These set of questions ask about the diversification of team members with respect to their expertise, experience and cultural backgrounds.			**N. Abu Mansor, S. Mirahsani (2012);G. Garrison, R. L. Wakefield, X. Xu, S .H.Kim(2010);Linda Peters Ronald J. Karren (2009);E. Amah, C. A. Nwuche, N. Chukuigwe(2013);P. Pinjani, P. Palvia(2013);Saxena, A. & Burmann(2014);Muethel, M., Siebdrat, F. & Hoegl, M(2012);Bao, G.M. et al.(2004);Von der Ohe, H., & Martins, N. (2010);Krebs, S. a., Hobman, E. V., & Bordia, P.(2006);**	
Variable	**Item**	**Reason**	**Reference of the item**	**References in the literature**

1. Functional Diversity	DV1: Members of the virtual project team are similar in terms of their functional expertise. DV2: Members of the virtual project team are different in terms of their years of organizational experience.	Functional Diversity involves a range of functional assignments [It means that the members are having similar knowledge of performing their tasks in the team] and demographic diversity includes a range of categories such as race, gender, ethnicity, and nationality. Diversity greatly effects the trust among the team members	Pinjani & Palvia , (2013)	N. Abu Mansor, S. Mirahsani (2012);G. Garrison, R. L. Wakefield, X. Xu, S .H.Kim(2010);Linda Peters Ronald J. Karren (2009);E. Amah, C. A. Nwuche, N. Chukuigwe(2013);P. Pinjani, P. Palvia(2013);Saxena, A. & Burmann(2014);Muethel, M., Siebdrat, F. & Hoegl, M(2012);Bao, G.M. et al.(2004);Von der Ohe, H., & Martins, N. (2010);Krebs, S. a., Hobman, E. V., & Bordia, P.(2006);
2. Cultural Diversity	DV3: The cultural diversity of virtual project team members introduces language barriers in the team.	Refers to people from different countries with different backgrounds. Cultural differences leads to negative performance of the project as it leads to distrust among them. Language barriers refers to the obstacle that exists when not all participants of communication have the same and/or required proficiency of the language used for the communication. It may	Horwitz, F.M., Desmond, B. & Ulrik, S.(2006)	H. Chang, S.Chuang,S. Chao(2011);P.Ferreira, E.Lima, S. da Costa(2012);E. Amah, C. A. Nwuche, N. Chukuigwe(2013);Pnina Shachaf(2008);Vinaja, R. (2003);B. Munkvold, I. Zigurs(2007); Daim, T., Ha, A. & Reutiman, S.,(2012); Dorairaj, S., Noble, J. & Malik, P., (2012); Horwitz, F.M., Desmond, B. & Ulrik, S.(2006);Nguyen, P., Babar, M. & Verner, J.(2006);Lee-Kelley, L. & Sankey, T., (2008);Maley, J.F. & Moeller, M.(2014);Zhan, Y. & Xiong, F.(2008);Bao, G.M. et al.(2004);Chutnik, M. & Grzesik, K.(2009);Berry, G.R. (2011);Nancy Penland Jenster(2009);Paul, S., & He, F. (2012);Paul, S., & Ray, S. (2009);Bodensteiner, N., & Stecklein, J.(2010);

		affect the trust in a negative way if not taken care of.		
3. Problem Solving Approach	DV4: Members of team differ in work ethics and their approach to problem solving.	Because of their different functional expertise and experience, each individual has got different work ethics and problem solving approach which becomes advantage and disadvantage at different situations.	S. M. Bryant , S. M. Albring, U. Murthy(2009)	S. M. Bryant , S. M. Albring, U. Murthy(2009)
Question 2:			**Reference**	
Team Member Characteristics: These set of questions ask about the calculative and rational characteristics of team members.			**S.Z. Schillera, B. E. Menneckeb, F. Nahc, A. Luse(2014);Eric W. Kuo, L. Thompson(2014);Yu-Ting C. Hung, A. R. Dennis, L. Robert (2004);B. A. AUBERT, B. L. KELSEY(2003);SIRKKA L. JARVENPAA, K. KNOLL,D. E. LEIDNER (1998);S. M. Bryant , S. M. Albring, U. Murthy(2009);N.Abu Mansor, S. Mirahsani , M. Saidi(2012);Mukherjee, D. et al(2012);Staples, D. & Ratnasingham, P(1998);Rusman, E. et al.(2010);Lau, E. & Rowlinson, S(2009);Kramer, R. M., & Lewicki, R. J.(2010);Riedl, B. C., Gallenkamp, J. V., & Picot, A(2013)**	
Variable	**Item**	**Reason**	**Reference of the item**	**References in the literature**
1.Cognitive Elements	TM1: The virtual project team members approach their job with professionalism and dedication.	Cognitive elements of trust refers to the calculative and rational characteristics of team members	Mcallister, (1992)	Kanawattanachai, P., Yoo, Y. (2002); F.Pangil,J. Moi Chan(2013);Xiao, W. & Wei, Q.(2008);Staples, D. & Ratnasingham, P(1998);Wong, W. et al.(2008);Zimmermann, A(2011);Ashleigh, M.J. & Nandhakumar, J., (2007);Melisa Beach , Sue Coates , Carol Hinton, D. M(2014);Pierce, E., & Hansen, S. (2013);

2. Ability	TM2: The virtual project team members exhibit technical competence.	Refers to the degree to which the trustee is believed to possess the necessary skills, competencies, and abilities within a specific domain. It is directly proportional to degree of trust.	Zolin, Hinds, Fruchter, & Levitt, (2004)	N. Abu Mansor, S. Mirahsani (2012);S.Z. Schillera, B. E. Menneckeb, F. Nahc, A. Luse(2014);Eric W. Kuo, L. Thompson(2014);Yu-Ting C. Hung, A. R. Dennis, L. Robert (2004);B. A. AUBERT, B. L. KELSEY(2003);SIRKKA L. JARVENPAA, K. KNOLL,D. E. LEIDNER (1998);S. M. Bryant , S. M. Albring, U. Murthy(2009);N.Abu Mansor, S. Mirahsani , M. Saidi(2012);Mukherjee, D. et al(2012);Staples, D. & Ratnasingham, P(1998);Rusman, E. et al.(2010);Lau, E. & Rowlinson, S(2009);Kramer, R. M., & Lewicki, R. J.(2010);Riedl, B. C., Gallenkamp, J. V., & Picot, A(2013);
3.Integrity	TM3: The members of the virtual project team are honest.	Refers to the degree to which the trustee is believed to follow principles and guidelines that are accepted by the trustor. This allows trustor to trust more on trustee.		
4.Benevolence	TM4: The virtual project team members take an extra effort to make your job easier.	Benevolence is the extent to which a trustee is believed to want to do good to the trustor, aside from an egocentric profit motive. It suggests that the trustee has some specific attachment to the trustor.	Zolin et al., (2004)	S.Z. Schillera, B. E. Menneckeb, F. Nahc, A. Luse(2014);Eric W. Kuo, L. Thompson(2014);Yu-Ting C. Hung, A. R. Dennis, L. Robert (2004);B. A. AUBERT, B. L. KELSEY(2003);SIRKKA L. JARVENPAA, K. KNOLL,D. E. LEIDNER (1998);Mukherjee, D. et al(2012);Rusman, E. et al.(2010);Lau, E. & Rowlinson, S(2009);Kramer, R. M., & Lewicki, R. J.(2010);Riedl, B. C., Gallenkamp, J. V., & Picot, A(2013);
Question 3:			**Reference**	
Task- Technology Fit: These set of questions ask about the nature of the tasks given to team members and its relationship with the technology.			**N. Abu Mansor, S. Mirahsani (2012);Jeremy S. Lurey,Mahesh S. Raisinghani(2001);P. Pinjani, P. Palvia(2013);S. Furst, R. Blackburn, B. Rosen(1999);Daim, T., Ha, A. & Reutiman, S.,(2012);Qi, L., Wang, K. & Ma, Z.(2010);Bergiel, E.B. & Balsmeirer, P.W.(2008);Xu, J. et al(2014);**	
Variable	**Item**	**Reason**	**Reference of the item**	**References in the literature**

1. Task Complexity	TT1: The virtual project team members perform repetitive activities in doing their jobs.	Refers to the nature of tasks. It says that more complex tasks call for more cooperation and coordination between team members because teams must search and evaluate alternatives.	Dayan & Benedetto (2010)	N. Abu Mansor, S. Mirahsani (2012);E. Amah, C. A. Nwuche, N. Chukuigwe(2013);B. Munkvold, I. Zigurs(2007);Xu, J. et al(2014);Bell, B. & Kozlowski, S(2002);
2. Task Interdependence	TT2: Members of virtual project team have to frequently obtain information and advice from other team members in order to complete the assigned task.	Refers to the extent to which unit personnel are dependent upon one another to perform their individual jobs. More dependence on each other means it requires more trust.	Wakefield, Leidner, & Garrison (2008)	Saxena, A. & Burmann(2014);Olson, J. & Olson, L(2012);
3. Relationship of Task and Technology	TT3: The project does not involve a lot of integration/interfacing with other softwares / systems. (reversed)	It is important in virtual teams' life cycle to evaluate the possible fit between various technologies available to virtual teams and the tasks which are called upon to be completed. The choice of technology depends on individual preferences, experience with the technology and its ease of use.	Park & Lee (2014)	N. Abu Mansor, S. Mirahsani (2012);Jeremy S. Lurey,Mahesh S. Raisinghani(2001);P. Pinjani, P. Palvia(2013);S. Furst, R. Blackburn, B. Rosen(1999);Daim, T., Ha, A. & Reutiman, S.,(2012);Qi, L., Wang, K. & Ma, Z.(2010);Bergiel, E.B. & Balsmeirer, P.W.(2008);Xu, J. et al(2014);

Question 4:			**Reference**	
Cohesion of Team: These set of questions ask about the relation amongst the team members and their level of satisfaction in working within the team.			**Peggy M. Beranek(2000);M.E. Warkentin, L. Sayee, R. Hightower(1997);G. Garrison, R. L. Wakefield, X. Xu, S .H.Kim(2010);S. Paula, P. Seetharaman, I. Samarah, Peter P. Mykytyn(2004);T. Brahm, F. Kunze (2012);Sridhar, V., D. Nath, R. Paul and K. Kapur(2007);E. Amah, C. A. Nwuche, N. Chukuigwe(2013);Dirks, K. T. (1999);J. Daspit C., J. Tillman ,N. G. Boyd ,V. Mckee(2013);S. Raghuram, R. Garud, B. Wiesenfeld, V. Gupta (2001);A. Diallo, D. Thuillier(2005);Chad Lin, C. Standing , Ying-Chieh(2008);S. M. Bryant , S. M. Albring, U. Murthy(2009);Dorairaj, S., Noble, J. & Malik, P., (2012);Brown, P.(2010);Horwitz, F.M., Desmond, B. & Ulrik, S.(2006);Beranek, P(2000);Bao, G.M. et al.(2004);Dakrory, M. & Abdou, H.(2009);Berry, G.R. (2011);Christoph Clases, Renhard Bachmann and Wehner, T.(2004);Nancy Penland Jenster(2009)**	
Variable	**Item**	**Reason**	**Reference of the item**	**References in the literature**
1. Respect	CO1: The members of your team respect each other.	Refers to respect towards team members which helps in understanding the colleagues and helps in developing trust among them.	Jeremy S. Lurey, Mahesh S. Raisinghani (2001)	N. Abu Mansor, S. Mirahsani (2012);Ashleigh, M.J. & Nandhakumar, J., (2007);
2. Affective Elements	CO2: Members in your team are considerate of other's feelings	Refers to the emotional aspects and social skill of trustees. Care and concern for the welfare of partners form the basis for affect-based trust	Wakefield, Leidner, & Garrison (2008)	Kanawattanachai, P., Yoo, Y. (2002); F.Pangil,J. Moi Chan(2013) ;Eric W. Kuo, L. Thompson(2014);Sridhar, V., D. Nath, R. Paul and K. Kapur(2007);Inju Yang(2014);Jeremy S. Lurey,Mahesh S. Raisinghani(2001);Dirks, K. T. (1999);S. Joe, Y. Tsai, C. Lin, Wei-Te Liu(2014);Xiao, W. & Wei, Q.(2008);Staples, D. & Ratnasingham, P(1998);Wong, W. et al.(2008);Zimmermann, A(2011);Melisa Beach , Sue Coates , Carol Hinton, D. M(2014)

3. Employee Satisfaction	CO3: Team members are not satisfied with the commitment of the group. (reversed)	Refers to the attitudes of the group members towards one another. As group members develop more positive attitudes towards one another, their satisfaction with the group's work increases and leads to greater trust among themselves.	Lin, Standing, & Liu (2008)	N. Abu Mansor, S. Mirahsani (2012);Inju Yang(2014);Peggy M. Beranek(2000);S.Chi, M. Yang, C. Tsou(2004);M.E. Warkentin, L. Sayee, R. Hightower(1997);M. Vakola, Ian E. Wilson(2004); S. M. Bryant , S. M. Albring, U. Murthy(2009);S. Joe, Y. Tsai, C. Lin, Wei-Te Liu(2014);

Question 5:			**Reference**	
Conflict within the team: These set of questions talks about disagreement or argument among team members with opposing opinions or principles.			**S. Paula, P. Seetharaman, I. Samarah, Peter P. Mykytyn(2004);Vinaja, R. (2003);Panteli, N. & Sockalingam, S(2005);Brown, P.(2010);Zimmermann, A(2011);Hosøy, L. H.(2011);**	
Variable	**Item**	**Reason**	**Reference of the item**	**References in the literature**
1. Conflict	CF1: The members disagree on the approach to complete the team task. (reversed)	Conflict is defined as ''an expressed struggle between at least two inter–dependent parties who perceive incompatible goals, scarce rewards, and interference from the other party in achieving their goals''. It leads to greater distrust among team members if not solved at appropriate time.	Wakefield, Leidner, & Garrison (2008)	**S. Paula, P. Seetharaman, I. Samarah, Peter P. Mykytyn(2004);Vinaja, R. (2003);Panteli, N. & Sockalingam, S(2005);Brown, P.(2010);Zimmermann, A(2011);Hosøy, L. H.(2011);**
	CF2: There is an existence of a conflict about delegation of tasks in the team.			
	CF3: There is friction and tension among members of the team.			

Question 6:			**Reference**	
Communication: These set of questions ask about the tools and technology used by the team.			**N. Abu Mansor, S. Mirahsani (2012);S.Chi, M. Yang, C. Tsou(2010);Sridhar, V., D. Nath, R. Paul and K. Kapur(2007);Yu-Ting C. Hung, A. R. Dennis, L. Robert (2004);H. Chang, S.Chuang,S. Chao(2011);P.Ferreira, E.Lima, S. da Costa(2012);P.Ferreira, E.Lima, S. da Costa(2012);Jeremy S. Lurey,Mahesh S. Raisinghani(2001);E. Amah, C. A. Nwuche, N. Chukuigwe(2013);Pnina Shachaf(2008);Chad Lin, C. Standing , Ying-Chieh(2008);S. M. Bryant , S. M. Albring, U. Murthy(2009);N.Abu Mansor, S. Mirahsani , M. Saidi(2012);Dorairaj, S., Noble, J. & Malik, P., (2012);Xiao, W. & Wei, Q.(2008);Bergiel, B.J., Bergiel, E.B. & Balsmeirer, P.W.(2008);Horwitz, F.M., Desmond, B. & Ulrik, S.(2006); Nguyen, P., Babar, M. & Verner, J.(2006);Saxena, A. & Burmann(2014);Kasper-Fuehrera, E. & Ashkanasy, N.(2001);Verburg, R.M., Bosch-sijtsema, P. & Vartiainen, M(2013);Olson, J. & Olson, L(2012);Wong, W. et al.(2008);C. Kimble(2011);Muethel, M., Siebdrat, F. & Hoegl, M(2012);Zimmermann, A(2011);Tran, F.Y.Y.L.H.B.T(2012);Lau, E. & Rowlinson, S(2009);Ashleigh, M.J. & Nandhakumar, J., (2007);Maley, J.F. & Moeller, M.(2014);Zhan, Y. & Xiong, F.(2008);Iacono, C.S. & Weisband, S.(1997);Mancini, D.(2010);Bao, G.M. et al.(2004);Chutnik, M. & Grzesik, K.(2009);Dakrory, M. & Abdou, H.(2009);Berry, G.R. (2011);Germain, M.-L(2011);Kramer, R. M., & Lewicki, R. J.(2010);Pierce, E., & Hansen, S. (2013);Hosøy, L. H.(2011);Thomas, D., & Bostrom, R.(2008);Bodensteiner, N., & Stecklein, J.(2010);Nakayama, M., Binotto, E., & Pilla, B.(2006);**	
Variable	**Item**	**Reason**	**Reference of the item**	**References in the literature**
1. Communication Tool/ Type	CM1: The team is equipped with adequate communication tools and technologies to perform their tasks.	It refers to Synchronous or Asynchronous tools used for communication. It also refers to communication quality which is defined as degree to which the content of the communication is received and understood by the other party in the relationship.	Jeremy S. Lurey, Mahesh S. Raisinghani (2001)	Jeremy S. Lurey,Mahesh S. Raisinghani(2001);E. Amah, C. A. Nwuche, N. Chukuigwe(2013);Pnina Shachaf(2008);Chad Lin, C. Standing , Ying-Chieh(2008);S. M. Bryant , S. M. Albring, U. Murthy(2009);N.Abu Mansor, S. Mirahsani , M. Saidi(2012);Dorairaj, S., Noble, J. & Malik, P., (2012);Xiao, W. & Wei, Q.(2008);Bergiel, B.J., Bergiel, E.B. & Balsmeirer, P.W.(2008);

2. Time difference and holidays	CM2: There is a time and holiday difference among countries, which results in delay in communication of project information.	Time and holiday differences among various project teams leads to delay in communication of project information; it greatly demotivates them leading to distrust among the various team members.		Jeremy S. Lurey,Mahesh S. Raisinghani(2001);E. Amah, C. A. Nwuche, N. Chukuigwe(2013);Pnina Shachaf(2008);
3. Training	CM3: I receive training on improving my technical skills such as using specific engineering and document control softwares. CM4: Training seminars are developed specifically to help us to communicate effectively with our fellow team members who work in geographically dispersed locations.	The training includes self-managing skills, communication and meeting training, project management skills and technology training and is important for the overall development of the team member which facilitates better understanding of other individuals in the team.	N. Abu Mansor, S. Mirahsani (2012); Peggy M. Beranek(2000); Jeremy S. Lurey, Mahesh S. Raisinghani (2001)	N. Abu Mansor, S. Mirahsani (2012); Peggy M. Beranek(2000);S.Chi, M. Yang, C. Tsou(2004);M. Vakola, Ian E. Wilson(2004);N. A.Ebrahim, S. Ahmed, Z. Taha(2009);S. Furst, R. Blackburn, B. Rosen(1999);N.Abu Mansor, S. Mirahsani , M. Saidi(2012);Lee-Kelley, L. & Sankey, T., (2008);Germain, M.-L(2011);

Section 4: Trust Among team members of Virtual Project team:	**References**
This section talks about trust among team members of Virtual Project team. Trust refers to the probability of team members living up to the expectations of their colleagues.	**Kanawattanachai, P., Yoo, Y. (2002); F.Pangil,J. Moi Chan(2013) ;Eric W. Kuo, L. Thompson(2014);Sridhar, V., D. Nath, R. Paul and K. Kapur(2007);Inju Yang(2014);Jeremy S. Lurey,Mahesh S. Raisinghani(2001);Dirks, K. T. (1999);S. Joe, Y. Tsai, C. Lin, Wei-Te Liu(2014);Xiao, W. & Wei, Q.(2008);Staples, D. & Ratnasingham, P(1998);Wong, W. et**

			al.(2008);Zimmermann, A(2011);Melisa Beach , Sue Coates , Carol Hinton, D. M(2014)	
Variable	**Item**	**Reason**	**Reference of the item**	**References in the literature**
Trust	T1: I was comfortable accepting procedural suggestions from other team members.	It is a dependent variable and considered important to realize the importance of trust among the team members of a virtual project team.	Lewis, K. (2003)	Ridings, C.M., Gefen, D. & Arinze, B., (2002), Thomas, D. & Bostrom, R., (2008), Curşeu, P.L. & Schruijer, S.G.L., (2010), Jarvenpaa, S. L., Knoll, K., & Leidner, D. E. (1998), Pierce, E. & Hansen, S., (2013), Paul, S. & He, F., (2012), Bao, G.M. et al., (2004)
	T2: I was confident relying on the information that other team members brought to the discussion.			
	T3: When other members gave information, I wanted to double-check it for myself. (reversed)			
	T4: I did not have much faith in other members' "expertise." (reversed)			

APPENDIX XI – ETHICAL APPROVAL

University of Salford MANCHESTER

Research, Innovation and Aca
Engagement Ethical Approval

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20 October 2015

Dear Sukhwant,

RE: ETHICS APPLICATION CST15/49 – Assessment of Trust within virtual project teams of Construction Sector in the Middle East.

Based on the information you provided, I am pleased to inform you that application CST 15/49 has been approved.

If there are any changes to the project and/ or its methodology, please inform the Panel as soon as possible by contacting S&T-ResearchEthics@salford.ac.uk

Yours sincerely,

Prof Mohammed Arif
Chair of the Science & Technology Research Ethics Panel
Professor of Sustainability and Process Management,
School of Built Environment
University of Salford
Maxwell Building, The Crescent
Greater Manchester, UK M5 4WT
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APPENDIX XII– DETAILS OF PUBLICATIONS

The original contributions of this study are supported by the following publications:

1. S. Kaur , M. Arif , and V. Akre," ***Factors affecting Trust in Virtual Project Teams in Construction Sector in Middle East"*** in 12th Post-Graduate Research Conference 2015 ,Media City UK, 10-12 June 2015,pp 262- 276.

2. S. Kaur , M. Arif , and V. Akre "***Effect of Social Media on Trust in Virtual Project Teams of Construction Sector in Middle East*****"** in IFIP International Federation for Information Processing 2016, Published by Springer International Publishing Switzerland 2016. I3E 2016, LNCS 9844, pp. 419–429, 2016. DOI: 10.1007/978-3-319-45234-0_38.